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RAILROAD GAZETTE

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RAILROAD GAZETTE

FRIDAY, JANUARY 4, 1901.

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Contributions

Construction and Maintenance by Contract.

Elmira, N. Y., Dec. 26, 1900.

TO THE EDITOR OF THE RAILROAD GAZETTE.

In his essay on "Wealth" Emerson says: "The crime which bankrupts men and states is job-work—declining from your main design to serve a turn here and there."

The main design of a railroad corporation is to transport people and goods; that is, to make transportation. The engineering, the mechanical and the track departments are accessory to the operating department, which they are to furnish with the plant necessary for its purpose, namely, to turn out transportation in the most economical manner. According to this view, are not the railroads declining far from their main design when they attempt to directly manufacture anything but transportation? To-day, no American railroad manufactures its metal bridges, nor, except in isolated cases, even erects them after the parts are assembled. Why not, it may be asked, and the answer is because the manufacture and erection of bridges require special tools and appliances, as well as specially trained workmen, and these the railroads do not have; nor could they afford them. The same may be said of the manufacture of rails, ties and other track materials—it is not economical for the railroads to manufacture them. Railroad machine shops, where new engines are built and heavy repairs and renewals made, are often very extensive plants employing hundreds of men, and carrying an immense stock of material, the purchasing and accounting of which require still other men, all of whom must be overseen by a large force of officials, themselves to be guided by the managing officers of the company, whose time and attention are thus diverted from their real work, that of transporting.

The successful handling of transportation requires the highest talent, even when the very best tools are furnished in place. Some years ago the movement of trains over a line of road might have been likened to a game of checkers; to-day it is chess.

If the work of construction and maintenance of track, and construction and maintenance of equipment were done by contract, under carefully prepared specifications, railroad officials would be relieved of a vast amount of details and be able to devote themselves much more closely to the strictly commercial side of their business. Instead of a large number of men to oversee they would have a small force of inspectors on their staff to see that the work of the contractors was properly performed.

There is plenty of data in the hands of any road on which can be based the cost of the different kinds of maintenance work, so that bidding for a given job would not be based on mere guesswork. Repairs on engines can be and are made just as good, and, all items of cost considered, as cheap, in private shops as in railroad shops. The same applies to the construction of new engines. Isn't the idea worth considering? W. L. DERR.

Wear of Rails in Tunnels.

We printed, Dec. 28, p. 864, a paper by Mr. Thomas Andrews, on the wear of rails in tunnels, and below are extracts from the discussion of that paper had at a meeting of the Institution of Civil Engineers (British).

Mr. J. C. Inglis (Great Western Ry.)—He had made some careful observations in tunnels and found that in most cases the loss was more from wear than from oxidation; in one tunnel, however, the loss was about half-and-half. In badly ventilated tunnels (not moist) a greater wear occurred on the top of the rail than was the case in rails outside; because, apparently, when trains had passed over, the top surface was left bright, the deleterious gases were able to attack it, and there was a certain amount of oxide formed which was removed by the next train that came along. The process of wearing down the top of the rail was thus considerably expedited.

He believed the determining factor in the wear of rails in tunnels was the ventilation—and by ventilation he meant the introduction of fresh air, and the removal, as far as possible, of moist air. But in the Severn Tunnel, for instance, assuming a train was running from Cardiff, it ran down into the tunnel on a gradient of 1 in 90, and came on the other side on 1 in 100. In 32-ft. rails put down in the sleeper-road 6 years ago, the wear on an 86-lb. rail in 6 years at the Welsh end of the tunnel was 1.69 lbs. per yard; 10 chains farther on the wear on a similar rail was 3.94 lbs. per yard; 10 chains farther on 7.51 lbs. per yard; and 10 chains farther on, or 30 chains from the face, it was 10.22 lbs. per yard, showing a steady progression of the rate of wear of the rail on entering the tunnel, where of course the ventilation was not so good, or where the passage of the gases over that particular part was greater. He had not calculated the wear per yard per annum, but it could be obtained exactly from the figures. At the east end of the tunnel, coming up the 1 in 100 gradient to come out of the tunnel, at 32 chains from that end, with rails of the same weight—86 lbs.—which had been laid 6 years, there was a loss of 11.63 lbs. per yard; 10 chains nearer to the mouth it was 10.69 lbs. per yard; 10 chains nearer again, for some reason or other, it was 11.63 lbs. per yard; and at the mouth it was 6.38 lbs. per yard, showing, as suggested, like the first series he had given, that there was the same tendency to increased wear as a less well-ventilated part of the tunnel was approached. The trains ran down without steam in the first place, and came up at the other side with all the steam on that could possibly be obtained, perhaps also letting down a little sand.

Mr. J. A. McDonald (Midland Ry.)—He had found the wear greatest in wet tunnels—nearly twice as great. About six years ago he began *painting* the rails in all tunnels that were at all wet or more than half-a-mile long. He painted them with four coats, three before they were put in and one after they were in the road, the paint used being red lead and boiled oil without anything added to it. Where the rails had been in long enough to judge, he had found this practice to result in lengthening their life by between 30 and 50 per cent. He had one case where the rails were in good order, and they had now been in longer than the rails which had been in the tunnel previously.

Method of Procedure in Remodeling Freight Yards.

BY W. C. CUSHING, *Superintendent, Pittsburgh Division, Pennsylvania Lines.*

[WITH AN INSET.]

For many years the *Railroad Gazette* has been publishing plans, descriptions of, and general articles on, freight yards, and it is a subject on which all possible light should be thrown because of the object of the yard, and the expense in constructing it. During the years 1892 and 1893, many of these articles were devoted to pointing out the generally bad design and inefficient service of the yards all over the country, for the reason that the year 1892 was an excellent business year, and many yards, poorly located or designed, showed their incapacity for handling a large traffic. The operating officers of many railroads saw that something must be done to improve the operation of yards, if such heavy traffic was to pass through expeditiously in the future, and began to look around for comparative plans. The principal blame was cast upon the design, or lack of design, of the yards, and the Engineer was quite largely made the scapegoat. Thus he was brought into the discussion of the subject, for those who had charge of some of these bad yards voiced their sentiments in the technical and railroad journals, with a view to having ideas and plans promulgated by others, and thus bring about a general improvement in the situation.

It was natural that the business depression which followed the year 1893 should result in a partial cessation of complaints, because the yards were again able to take care of the reduced business as before, and the railroad companies had none too much money to spend on improvements, but the fire still smouldered.

The following quotation from a letter to the *Railroad Gazette*, 1893, page 255, by Mr. A. Morrison, states the text for this article:

"It is well known that division terminal yards especially are grossly insufficient in capacity, and defective in design. It is a common occurrence to see the business in these yards butchered daily, so to speak, with a resulting universal obstruction to business and an enormous expense for switching or shifting. *No railroad yard should be constructed without the engineer in charge taking advantage of all the information possible to be gained, from the Superintendent down to the brakemen of the shifting crew;* and while it is impossible for any civil engineer to have practical knowledge of all branches of railroading, still so long as he will continue to consider himself lord of all these practical branches, our yards will remain a discredit to intelligent railroad men."

The writer agrees with Mr. Morrison in his ideas as expressed in italics, and what follows is intended to describe the plan adopted by a prominent railroad company, when preparing to remodel several of its largest and most important yards.

A committee is appointed by the General Manager consisting of the Chief Engineer, his Principal Assistant Engineer, and the Superintendents, Engineers, and Assistant Engineers of all the divisions entering the yard in question. The Superintendent who has charge of the yard, is the chairman, and the committee meets regularly once a week for two months, or as much longer as is necessary to prepare the plan and report. The committee as a whole, during the first part of its existence, visits prominent freight yards which are known to have been thoughtfully and carefully designed, and discusses the best typical plan, and general principles of yard work, and design; while the detail information concerning the yard in question is being prepared by subcommittees. The officers engaged in the work are divided into:

(1.) A sub-committee to gather all the statistics of the operation and traffic of the yard.

(2.) A sub-committee to make various sketch plans to be discussed by the general committee.

(3.) A sub-committee to read and abstract a number of the important articles on yard design and operation in the technical journals and books, for the preceding period of 10 or 15 years. These abstracts are accompanied by the sketches of the yards they describe, and are in such form that they can be readily studied by the general committee.

After statistics and plans have been prepared, the yard master and his assistants are requested to attend some of the meetings of the committee, and invited to criticize the plans. They, in turn, undergo a regular cross-examination by the committee, as though on the witness stand.

The study of the yard literature leads to a statement of the fundamental principles of the work in hand.

General Principles Governing Yard Design and Operation.

Some of your earlier correspondents have said that each yard has to be studied by itself, and on its own merits, and that it is almost impossible to lay down general rules for yard design. This is, in a measure, true, but it will be found that there are many fundamental principles which should be aimed at, even though many of them cannot be attained in individual cases. Nevertheless, it is important to keep them in mind.

Classification always assists the mind in grasping the situation, and yards may be classified in two distinct ways:

I. *By the method of switching.*

II. *By the character of the traffic and service to be rendered.*

I. *The methods of switching* are:

(a) Tail switching.

(b) Poling or staking.

(c) "Dos d'ane" or "hump."

(d) Gravity solely.

(a) *Tail Switching.*—This is the method employed in the great majority of yards in this country, and is the only one applicable in many cases, sometimes because of the character of the work, and sometimes the environments, especially in large cities. Freight house yards and small assembling yards are almost invariably switched in this way, and likewise a large number of the junction, division point, and railroad terminal yards. It is the old-fashioned style and should be dispensed with wherever practicable. The yards where this kind of switching is practiced, are the yards which first become clogged when the traffic grows heavy, and which have given rise to the various complaints about poorly-designed yards, one of which the writer took for his text. They are simply a collection of tracks, multiplied from time to time to suit the growing traffic, till they have become unwieldly.

(b) *Poling or Staking.*—This has come to be recognized as the standard method of switching for large distributing yards, whether at junction and division points, or at tidewater terminals, admitting as it does, of the rapid disposition of the cars in a train, and of indefinite expansion, provided the land does not impose a limit. When assisted by gravity, the breaking up of the train is very rapid indeed. When the yard consists of more than the reception, poling and classification tracks, and is at the same time unassisted by gravity, the assistance of tail switching or, at least, pushing, is necessary.

There are already in this country a large number of yards employing this method of switching, some of which have been described in the *Railroad Gazette* and the *Engineering News*, from time to time, as follows:

Philadelphia, Penna. R. R., *Railroad Gazette.*
Harrisburg, Penna. R. R., *Railroad Gazette*, 1886.
Altoona, Penna. R. R., *Railroad Gazette*, 1886 and 1892, p. 222.
Williamstown, Mass., Fitchburg R. R., built 1887. *Engineering News*, Vol. 31, 1894, p. 443.
Walls, Pa., Penna. R. R., about 1891.
Denver, Colo., Union Pacific, *Railroad Gazette*, 1891, p. 229.
Columbus, O., P. C. C. & St. L., *Railroad Gazette*, 1892, p. 222.
Packerton, Pa., Lehigh Valley, *Railroad Gazette*, 1892, p. 362.
Port Jervis, N. Y., N. Y., L. E. & W., *Engineering News*, Vol. 35, 1896, p. 21.

East Detroit, Michigan Central, *Railroad Gazette*, 1897, p. 780, built 1896.
Hawthorne, Ill., C., B. & Q., *Railroad Gazette*, 1889, p. 818, and 1898, p. 931.
Conway, Pa., P. F. W. & C., 1898-1899.
Some of these are aided by gravity, but, in such cases, it is generally only in one direction.

(c) *"Dos d'ane" or "Hump."*—This is the method of switching by gravity used in France, and it has been already described in the *Railroad Gazette*, 1889, p. 490, by Mons. Reneé, Traffic Manager of the Paris, Lyons & Mediterranean R. R. The accompanying Fig. 1, reproduced from page 491 of the above issue of the *Railroad Gazette*, shows the mode of operation. The switching track is raised up in the shape of a pyramid, in advance of the yard switches, with a 1 per cent. grade each side and, as the cars are pushed over the summit, they separate from the train and run toward the yard where they are received by the yard men. The rest of the yard in this case is level.

The plan seems to have been first put in use in this country at the Honey Pot Yard of the Sunbury Division of the Philadelphia & Erie, but a modification was introduced by having the yard on a 0.63 per cent. and 0.12 per cent. grade, and the ladder on a 1.27 per cent. grade, which very much quickened the switching operations. Moreover the hump grade was made 1.75 per cent. instead of 1 per cent.

In the past year the plan has been adopted by the P., C., C. & St. L. Ry. Co., in its Bradford (Ohio) and Richmond (Ind.) yards. At Bradford, the yard was already on a grade, and all that was necessary to take advantage of this mode of distributing cars, was to put a "hump" in the switching track, which was done at very little cost.

Skates, or shoe-brakes, similar to those illustrated on page 491 of the *Railroad Gazette* for 1889, have been used for several years in the Columbus (Ohio) yards of the P., C., C. & St. L. Ry. Co. for arresting the speed of runaway cars.

In a paper read before the New England Railroad Club, which was abstracted in the *Railroad Gazette*, 1894, p. 281, Mr. E. K. Turner shows that gravity switching is from 30 per cent. to 59 per cent. cheaper than tail switching.

(d) *Gravity Switching.*—This means that the several divisions of the yard are on such grades that the cars will start from any point upon the brakes being released. The service of a yard engine is, therefore, only required to feed the yard at the upper end, and the cars are ready to be taken away in trains at the lower end by the road engines when the classification and sorting are completed. The famous Edge Hill yard, near Liverpool, England, described in the *Railroad Gazette*, for 1887, p. 243, still remains as the most perfect type of this mode of car distribution, although it was designed and begun in 1873. It was designed, too, by an Engineer, Mr. Harry Footner. The Dresden yard in Germany follows the Edge Hill plan quite closely, but the preparation of the ground was very costly, a fill of 70 ft. at the upper end having been required. It was at this yard that the first gravity switching in Germany was done, and it was put into operation in 1894. Its length is 1.55 miles and its greatest width 55-100 mile. The writer knows of no yard in the United States where switching is done solely by gravity.

II. *Classification by the character of the traffic, and service to be rendered.*

The second way to classify yards is by the use to which they are put, and the following list composes the most important:

(a) *Freight House and Bulk Unloading Yards.*—Generally consist of spur tracks in pairs.

(b) *Single, Two-ladder Yards.*—These consist of a collection of parallel tracks, connected with the switching track by a ladder at each end, and are generally either a parallelogram, in shape, as in Figs. 2 and 3, or trapezoidal, as in Fig. 4. It is probably our first type of yard, when, in the early days the business was not large, and tracks have been added as the traffic increased, until finally a very heavy business was conducted in it. Its defects were then fully apparent, and it was condemned as badly designed. Nevertheless it is the type of a vast number of yards in this country to-day. It still serves its purpose at small places. Such yards are used for a general business of all kinds, at terminals, division points, junction points, etc., and, where the classifications are few, answer the purpose very well. The train pulls out of the yard, and, after the road engine has been cut off, the classification is always made by tail switching.

(c) By introducing reception tracks in advance of the quadrilateral yard just described, as in Fig. 5, so that trains may be cleared from the main tracks and the road engine released, while the yard crew are at work breaking up a previous train, the capacity and value will be greatly increased. Many of the old yards are being remodeled in this way, and are very suitable for a great many places. If the business is heavy, poling will be found to be economical. Local freights can be arranged in station order by pulling them back to the reception lines and again drilling them to the classification tracks. The yard is adapted for use at all places, whether at division points or terminals, only in the former case separate yards for east and west-bound, or north and south-bound traffic will be advisable. A large number of examples of this yard can be given.

By the introduction of a *hump*, or *dos d'ane* at "A" as in Fig. 1, the process of switching becomes remarkably rapid, and economical. As already stated, the plan is used in France, and has been put into service in this country at Honey Pot, Bradford, Ohio, and Richmond, Ind. It will spread rapidly, as the advantages are quickly apparent.

If the location is favorable, the yard may be operated solely by gravity.

(d) When the passenger traffic is important, and the freight business heavy, the arrival and departure of trains will be intermittent, and it will be advisable to separate the classification and departure tracks, which leads to the next type of yard illustrated in Fig. 6. This is a very desirable type, and may have great capacity, especially if assisted by gravity. An example of this is to be found at Port Jervis, N. Y., on the Erie.

If separate poling tracks are introduced between the reception and classification tracks, we have the well-known Altoona Yard of the P. R. R. The new west-bound yard of the C., B. & Q., at Hawthorne, Ill., is similar to the Altoona yard with the departure tracks omitted.

(e) It is but a step to the last type, the Edge Hill yard, near Liverpool, England, on the London & North Western, which has been already fully described in the *Railroad Gazette* and other publications. It differs from the foregoing type in that it has sorting sidings, or "gridirons," introduced between the classification and departure tracks for the purpose of arranging the cars of trains made up on the classification tracks in the order of their delivery to the various industries and towns.

Nothing has been said in the above descriptions about the various details which have to be introduced into particular yards such as, scales, car repair tracks, storage and hold-for-order tracks, and coaling and engine-housing facilities, as it was the writer's intention to present types only.

Principles.

After a study of the yard literature presented by the sub-committee, it is the province of the general committee to consider the fundamental principles governing yard design, and to have the sub-committee on plans design a typical yard to meet the requirements.

Some of these conditions may be stated as follows:

(1) The yards should be between the main tracks, so that the freight traffic will not have to cross the passenger traffic, and freight trains will not interfere with each other.

(2) There should be reception tracks of sufficient number to receive a maximum number of freight trains in a brief period, so that the main tracks will be cleared quickly, and the road engine be released. A bunching together of trains is caused by wrecks, washouts, passing fast freights around slow freights, etc., and it is quite probable that they will enter the yard in convoys.

It is important to release the power promptly that the yard for trains in the opposite direction may be kept free. Cramping the receiving tracks and holding out trains will not hasten the yard work. The tracks should be of sufficient capacity for the longest train, with some margin for future growth. Although the weight and power of locomotives have been increasing rapidly, and their capacity, by grade reduction, in addition, the capacity of the car has been increased also, so that the increase in train length is not in proportion to the growth of the locomotive. An allowance of 50 per cent. ought to meet the requirements of probable expansion for years to come.

(3) The yard should be arranged for operation by gravity, in which event no poling tracks are required, but, as it is so unusual to find a location suitable for gravity distribution, it is best to suppose that poling will be the method of switching employed.

Poling can be done by using one of the receiving tracks, but, for very large business, it will be found advisable to have separate poling tracks, three in number, two of which are kept supplied with cars from the receiving tracks by an extra engine, as at Altoona. The required length of poling tracks is about one-quarter greater than the reception tracks, so that the poling engine may have ample space in which to begin work on the train.

As a great many cars in a train have to be weighed, the proper place for the scales is in the throat between the poling tracks and the classification tracks, and two separate sets of scales are necessary in order to avoid delay when repairs have to be made. An important fundamental principle of yard design is to keep the cars always in forward movement, and cars should not be dragged back from the classification yard to be taken to the scales in some remote place, and weighed.

(4) The caboose should be poled, as in the case of the other cars, into its appropriate track, and, as it generally returns in the opposite direction, its appropriate track should be located to place the cars in the order of first in first out, and be a gravity track so that the caboose can be dropped to the rear of the outgoing train by simply releasing the brakes. This is a very difficult arrangement to make in most cases. Mr. J. J. Turner says (*Railroad Gazette*, Vol. 27, 1895, p. 465) "it is the bull in the china shop, and is always in the way."

(5) There are nearly always classifications of trains to be made in yards, as it is difficult to secure solid trains which can be taken unbroken all the way from initial point to destination. Classification tracks are therefore required, though the number is entirely dependent upon the local conditions. Each track should be of the length necessary to hold the longest train of the division hauling it. Sometimes tracks of different length are advisable. They are simply tracks on which to build solid trains for particular destinations, no matter what may be the order of the cars. It is much better to use these tracks for *trains* than for *destinations*. A train with cars for several places is much more quickly built than one for a single destination, and when the train is moved the track is ready for another. In general there should be one and one-half times as many classification as receiving tracks.

(6) There must be a yard near the classification yard into which the crippled cars may be sent direct from the poling tracks. After being repaired, they should be sent forward, not taken backward, through the sorting tracks to their trains. If they are made the length of a train they can be used as an overflow classification yard. By dividing them by ladders, special movements of repaired cars can be made.

(7) Cars to be stored or held for orders should never be allowed to be mixed with the regular traffic on the classification tracks, and hence separate tracks for this purpose, which are reached direct from the poling tracks, should be provided. It is generally necessary to haul such cars back, and repole them into the classification yard when the destination is known, making the exception required to clinch the rule.

(8) Many of the trains made up on the classification tracks will, for various reasons, have to be arranged in station order, or for order of local delivery, and the most convenient and expeditious arrangement is the gridiron of the Edge Hill yard. There should be a pair for each set of classification tracks, to enable the most difficult case of sorting to be solved, as will be seen by an examination of Fig. 7. Each gridiron must be capable of holding the entire train, and the number of tracks should at least equal the square root of the number of cars in the train. Thus, if the train length is 49 cars the number of tracks should be 7. The car capacity of each track should equal the number of tracks.

(9) After passing a train through the sorting yards, or gridirons, there should be a place to hold it till the road engine and caboose are attached, and until it receives orders to proceed to its destination. The main track may be particularly busy just at that time, or a passenger train may be due, and, in order to prevent a stoppage of yard work, the starting lines, or advance starting tracks must be provided. Furthermore, they help in minimizing the time spent by the road engine between the engine house and the yard.

(10) The entrance and exit of yards should be controlled by interlocking plants, and the yard switches should be thrown by electro-pneumatic plants not interlocked.

(11) There should be inbound and outbound engine tracks, so that locomotives can run to and from the engine house without fouling the yard switching.

(12) The coaling and ashpit facilities should be well arranged and of good design, and water cranes or standpipes located at many convenient places throughout the yard to prevent loss of time to yard engines in running for water.

(13) Provide ample telephone service between the different portions of the yard, the telegraph towers and the roundhouse.

(14) Keep the switches as close together as possible which can be best accomplished by the use of No. 7 frogs on a No. 6 ladder. Slip switches are to be used as sparingly as possible, but they are very convenient indeed for concentrating turnouts and crossings and, if properly maintained are no more objectionable than any other frog and switch. The movable point middle frogs are to be avoided unless connected with an interlocking plant. Curved tracks, except in switch leads, are very undesirable.

(15) For switching at night electric lights are necessary, placed on high poles as in the Dresden yard in Germany. (*Railroad Gazette*, Vol. 28, 1896, p. 535.)

A typical plan embodying the above principles was drawn up several years ago by a committee of a prominent railroad company, and is illustrated in Fig. 8. It is quite similar to the plan presented by Mr. Derr some years later in *Engineering News*, Vol. 35, 1896, p. 395, but, while both plans are admirable this one has some advantages over Mr. Derr's. The principal superiority is in the arrangement of the repair tracks. The east and west-bound repair track yards are kept close together, so that the material and men are concentrated instead of requiring two separate and distinct repair yard organizations, as is the case with Mr. Derr's plan. Furthermore, the committee plan places the repair tracks beyond the poling tracks so that cripples are poled directly to their place when the train is broken up. It is not clear how Mr. Derr gets his cripples into his repair tracks. The repair tracks of the committee plan can be used as classification tracks in case of an unusual amount of business.

It seems to the writer that Mr. Derr's fast freight tracks are unnecessary, as they add length to an already long yard in the position shown. The advance tracks or starting lines will serve the purpose equally well, if there are enough of them. The circular caboose track is an excellent feature in both plans, as it is an ideal way of disposing of cabin cars. Mr. Derr's single gridiron, or "local order" tracks, is not sufficient to solve the most difficult problem of sorting in station order, as reference to Fig. 7 will show.

The estimated capacity of the committee plan is 6,912 cars a day, and the total length will be about three miles, or practically the length of the Altoona yard.

Some writers have intimated that there is such a difference in the operation of division yards, and seaboard or other terminals, that they cannot be considered in a

general way, but, it will be seen, by reference to the typical plans presented, that the division yard is nothing more nor less than a double terminal yard to keep the east and west, or north and south, bound traffic separated. That even this is not absolutely necessary is illustrated by the Edge Hill yard, which is the distributing yard for Liverpool, and is used for traffic in both directions. In fact, nearly every yard in the country is a fractional part of the typical plan for a complete yard.

While the study of yard literature and typical plans have been engaging the attention of the general committee, the sub-committee on statistics has been accumulating the data relating to the traffic movement in the yard to be improved.

This is a division point yard for three divisions, A, B, and C, situated in a large city, where land is valuable and where the surrounding conditions make the problem of improvement a difficult one. Connected with it is a large freight transfer, where less-than-carload freight is consolidated into carload lots; and it is an important icing station for eastbound refrigerator cars. A correct design for this work is of great importance. In addition to the above, there are seven other railroads participating in an interchange traffic.

The traffic passing through the yard therefore consists of:

(1) Through traffic from Division A to Divisions B and C, and through traffic from Divisions B and C to Division A.

(2) Freight from each division to the (a) house and transfer platforms, (b) shops, (c) industries, and (d) interchange roads, and a corresponding return business.

The total through and local business passing through the yard each day is given in the two following tables:

Inbound Local and Through Business in Cars Per Diem.

Average cars per day.

Delivering division.	Total.	Local. Cars.	Local. % of tot.	Max. cars per day. Cars.	Max. cars per day. % of ave.
C (East)	168	72	43	292	182
B (East)	418	88	21	637	152
Total east	586	160	27	929	161
A (West)	521	109	21	1,043	200
Grand totals	1,107	269	24	1,972	180

Outbound Local and Through Business in Cars Per Diem.

Average cars per day.

Receiving division.	Total.	Local. Cars.	Local. % of tot.	Max. cars per day. Cars.	Max. cars per day. % of ave.
C (West)	168	64	39	280	167
B (West)	401	93	23	704	176
Total west	569	157	27	984	173
A (East)	528	102	20	859	163
Grand totals	1,097	259	23	1,843	167

These two tables indicate a very large local business which requires that nearly every train shall be broken up as it enters the yard, thus preventing advantage being taken of the economy and convenience of solid trains passing through. Consequently, a liberal number of reception tracks must be provided, probably about 6, for the 18 to 21 trains in each direction.

In order to decide the length of the reception tracks the maximum train length must be determined, and allowance made for future growth. Table No. 1 supplies the information.

It will be noticed that a very small percentage of the trains are over 40 cars in length, but it is always wise to provide for double headers, and therefore the receiving tracks should be about 80 cars in length. These will also accommodate the small percentage of trains exceeding the 40 cars in length.

The number of the classification tracks will be determined by the distribution of the cars, which is given in detail in table No. 2.

The business for Divisions B, C, and A, being through business, must be classified into trains, the traffic from A being divided between B and C for westbound, and A carrying all the eastbound. Division A delivered to B and C 412 cars, and received from them 426 cars, or about 18 or 19 trains each way. Besides this, the interchange of business is sub-divided as shown in table No. 3.

TABLE NO. 3—AVERAGE DAILY DELIVERIES.

Destination.	Cars into city for Ry. in column 1. B.	C.	Total.	A.	Grand total.	Cars out of city from Ry. in column 1. B.	C.	Total.	A.	Grand total.
D. E. Ry	10	15	25	9	34	16	14	30	7	37
F. G. Ry	3	4	7	4	11	2	3	5	4	9
H. I. Ry	2	2	4	1	5	2	1	3	2	5
J. K. Ry	5	4	9	3	12	2	4	6	3	9
L. M. Ry	10	12	22	6	28	10	11	21	8	29
N. O. Ry	8	9	17	3	20	7	7	14	3	17
P. Q. Ry	9	4	13	5	18	7	3	10	4	14
Industries	5	..	5	10	15	5	..	5	10	15
Frt. and transfer	30	22	52	52	104	12	..	12	17	29
Shops	6	..	6	16	22	30	21	51	44	95
Total city	88	72	160	109	269	93	64	157	102	259
Through	330	96	426	412	838	308	104	412	426	838
Grand total	418	168	586	521	1,107	401	168	569	528	1,097

These tables show the necessity for a large number of classification tracks. It is estimated that about 20 tracks will be required for each yard, two of which in the eastbound are for icing refrigerator cars.

About five departure tracks will be required to meet the exigencies of delayed trains and power, with the sorting tracks between the two yards for marshaling the local freight in proper station order.

Besides the plan which was prepared from this data to fit the ground available for it within reasonable cost, a plan was prepared on the supposition that unlimited territory was available and that advantage of gravity in each direction could be obtained.

This plan is presented in Fig. 9 for the consideration of your readers. It is 4.9 miles long, so that the assistance of gravity for each yard may be obtained without too great expense. It is often best to build the two yards side by side, and work them in the same direction as at Edge Hill, and thus reduce the length.

Railroad Scrap.

In our issue of Nov. 9, p. 742, appeared extracts from a paper on handling scrap, by Mr. J. A. Carney, read before the St. Louis Railway Club. Below are a few extracts from the discussion of that paper at the November meeting.

Mr. S. M. Dolan (Wiggins Ferry)—The method of handling scrap in 200 units or more, I should judge to be a good one, and can be used with equal success in any shop. There are points, however, that I regret Mr. Carney did not touch on. That is, just what material should go to the scrap pile and what should be used again. It is the custom, I believe, with some railroad companies, and not a few, either, to throw all material that has been removed into the scrap pile, or scrap bins, before it is put in the bins. Not only is the pipe, sheet iron, borings and turnings, malleable and steel, and No. 1, stored separate, as is the usual custom, but material that can be used to advantage is placed on platforms or racks, where it can be selected as easily as the new. Take car scrap, for instance. From broken couplers are removed the locks, knuckles, knuckle pins and other parts that are not broken, including the sleeve, whether bolted or riveted. Parts of broken king bolts and drawbar stems that can be mated go direct to the blacksmith shop and are welded. This may not be economy where a header or bulldozer is used. Broken brakestaffs are also welded and go into the proper rack. Bent, broken or thread-battered bolts are usually piled until several hundred have accumulated, then a laborer takes his gages, which consist of sticks on which are marked lengths and diameters of bolts standard to the shop. All bolts conforming to standard dimensions and are straight go to bolt cutter; if not, are cut at shears to nearest standard length they will make. Bolts, after being threaded, go to store-room and are invoiced out at a price covering the above labor. Nuts go direct from repair shop to nut tapper and then to storeroom, being charged same as second-hand bolts. Metal brake-beams, brake-rods, levers and other parts bent, but not broken, go direct from repair track to blacksmith shop and from there to rack. Round iron is, of course, a staple if long enough to make standard bolts, and is treated accordingly.

Mr. G. W. Mudd (Master Mechanic, Wabash)—I desire to touch upon the subject, briefly, as outlined by Mr. Carney, more especially as to his statements of the advantage to be gained by handling scrap as he suggests, through the medium of 200-lb. boxes. This I consider, with reference to machine shops, as hardly practicable. Most all machines are supplied with a shallow tray or pan that catches the turnings. As we handle this at our shops one man makes the rounds, gathering up the different kinds of scrap, taking it to our scrap bins. To utilize the box for this purpose would necessitate two men making the rounds to gather up the turnings from the machines, and to leave them under the machine they would be in the way of the workmen.

The system as practiced here is a series of bins constructed of heavy timbers, capable of holding from 12 to 30 tons of scrap, designed to admit wheelbarrow loads from one side, the other side fronting on the track where the scrap is loaded into the car. We have one bin for each class of scrap, and the man taking this from the shop is required to take to each bin the proper class of scrap. In doing so, if he finds an article of scrap in that taken from under one machine foreign to the class, he removes it and places it where it should be. It is possibly a fact that the scrap could be handled from bin to car much cheaper in the box described by Mr. Carney if the company did not have to furnish the material and labor to make the box. Taking this cost into consideration, I doubt if there would be any saving in the handling.

I note one idea advanced as to the bins being made in the form of a chute, and my opinion on this is that the bottom of the chute would have to be almost perpendicular. To fill such an one with cast or wrought iron borings or turnings, exposed to the weather, in a month or so this mass would become so rusted as to almost solidify, and the gate being open, it would have to be shoveled and possibly dug up with a pick in order to loosen it enough to load it, to say nothing of the expense of constructing such a scrap bin. I am of the opinion that it is not practicable.

Mr. Carney's paper treats with only a portion of the scrap problem. He does not make any provision for handling flues, scrap sheet iron in large pieces and the ordinary cuttings from boiler work. These classes we find take more room to store and possibly as much labor to load and care for as the other kinds. We handle them in the same manner as first mentioned.

I heartily agree with Mr. Carney in his reference to old railroad ties as wood for locomotives, except as to the cost of getting them in shape for use. We have practically abandoned on this division the use of ties for wood, having found that it is more expensive, with less actual result, as fuel in firing up locomotives, than the wood we can buy. Our experience has been that the ties can be sawed or chopped, split and piled for use, at an average cost of about 60 cents per cord. Added to this the charge for picking up and hauling brings the cost of this as wood to about $1 or $1.10 per cord. This is about the price that cord wood can be purchased for, but is very inferior to cord wood.

Mr. S. J. Kidder (Westinghouse Air Brake Co.)—The Amoskeag machine shop, of Manchester, N. H., built locomotives from 1843 to 1857, and for some twenty years following the latter date, the famous Amoskeag steam fire engine. The shops were located on the bank of the river, there being some 20 ft. of water immediately under the windows on one side of the shop. About the time the building of fire engines was discontinued the Amoskeag Co. had occasion to "throw" the river away from the shops, after which the water was pumped out, exposing the vertical wall upon which the side of the shops rested.

TABLE NO. 1—LENGTH OF TRAINS.

Division.	Received by division. No. of trains. Ave.	Max.	No. of cars per train. 1 to 29.	30 to 39.	40 to 49.	50 to 69.	Delivered by division. No. of trains. Ave.	Max.	No. of cars per train. 1 to 29.	30 to 39.	40 to 49.	50 to 69.
C	6	8	57%	29%	11%	3%	6	8	49%	48%	2%	1
B	15	18	72%	28%	..	..	15	20	62%	25%	10%	3%
Total	21	26	66%	33%	1%	..	21	28	61%	26%	11%	2%
A	18	23	49%	34%	11%	6%	18	24	74%	26%	..	..
	39	49	58%	33%	6%	3%	39	52	66%	27%	6%	1

TABLE NO. 2—DAILY CAR MOVEMENT TO, FROM AND THROUGH THE CITY.

Received from.	Delivered to. B.	C.	A	Interchange.	Frt. and transfer.	Shops.	Industries.	Total. Cars.	Per cent.	Max. cars.
B	..	..	330	47	30	6	5	418	31	637
C	..	..	96	50	22	..	..	168	12	292
A	308	104	..	31	52	16	10	521	38	1,043
Interchange	46	43	31	..	..	..	..	120	9	453
Frt. house and transfer	30	21	44	..	..	..	..	95	7	177
Shops	12	..	17	..	..	..	..	29	2	200
Industries	5	..	10	..	..	..	..	15	1	60
Total cars	401	168	528	128	104	22	15	1,366	..	..
Total per cent.	29	12	39	9	8	2	1	..	100	..

There was also exposed an accumulation of scrap metal that had from time to time been dumped out of the windows. This accumulation amounted to some 600 tons. As compared to the present methods of saving scrap, this will serve to show that considerable progress has been made.

The Design of Structural Steel Cars.

By George I. King, *American Car & Foundry Co.*

For the reason that some of your readers may be interested in the enclosed specifications for steel freight cars and freight cars with metal underframes, we send you certain standard specifications covering the design of freight car equipment of these types.

There are several features of practice involved that perhaps are different from the usual procedure in such cases, and to these attention is particularly invited. We refer especially to Articles 8 to 17 inclusive, besides Articles 18 and 19. From the former it will be noted that it is thought desirable to design all cars *on a basis of maximum static axle loads;* these being the loads that the Master Car Builders' axle committees have used in the design of the respective axles; that is to say, in the case of 4¼ x 8 axles for 30-ton cars, the assumed maximum load above the journals is taken to be 96,000 lbs. For 5 x 9 axles under 40-ton cars the greatest load above the axles is assumed to be 124,000 lbs., and for 5½ x 10 axles under 50-ton cars the maximum load acting on the journals is taken as 152,000 lbs. Of these maximum static axle loads only one-fourth or less represents the weight of the empty car *above the journals*, or what is known in our specifications as the dead load of 8-wheel equipment, while the remaining three-quarters, or more as the case may be, provides for the so-called live load or the weight of the material carried by the car.

Observe, that in the case of all equipment this live load is taken to be the *nominal capacity* of the car + 20 per cent; that is to say, for 30-ton cars, 60,000 lbs. increased by 12,000 lbs., or 72,000 pounds total; similarly for the 5 x 9 axles, for which the greatest live load is taken to be 96,000 lbs.; and likewise for the 5½ x 10 axles under 50-ton equipment, where the maximum live load is assumed to be 120,000 lbs. per car.

It is believed that this practice is adapted to actual working conditions, and insures sufficiently large forces to provide for the uneven distribution of bulky loads and lack of attention in trimming coarse freight. We desire to emphasize the fact that the live loads as herein taken are the rated capacity of the car increased by 20 per cent. rather than by 10 per cent., which latter is the commonly allowed excess over marked capacity figures.

Attention is directed to Article 13, providing for uniform distribution of loads over entire floor area for all flat bottom equipment in making calculations of stresses, etc., arising from the assumed live loads. In the case of hopper bottom equipment it is best, of course, to design such cars on a basis of so much weight per cubic foot of space, which is certainly the only rational method for cars of this type.

From the report of the Master Car Builders' Axle Committee, published in the 1896 *Proceedings*, it is evident that, barring the arch bars, the results therein shown are sufficient warrant for doubling all static stresses in truck members resulting from the above-mentioned loads, in order to take account of impact, vertical oscillation, centrifugal force, and other forces of uncertain origin acting on these members. It is clearly demonstrated in the report just referred to that the static vertical reaction at any one journal may be increased 98 per cent., or in other words, the static load applied at this point may be practically doubled under dynamic conditions. If the truck spring compression may be twice that due to a condition of static loading only, it is evident that the forces actually applied to cause this compression must be twice as great as static conditions contemplate, and, therefore, the resultant stresses in truck members at least are possibly twice as great as those derived from static considerations alone. Apparently, this remark is true of all important truck frame members, aside from the arch bars, which are in a condition of complex stress and subject to the action of a great variety of conflicting forces. Concerning the design of arch bars for any type or capacity equipment, it is believed that an article published in the *Railroad Gazette*, under date of October 5, 1900, outlines the only rational method to pursue in structures of this type.

It will be observed from Article 17 of the Standard Specifications, that in the case of all superstructure members above the body bolsters, it is thought desirable to increase by 50 per cent. the stresses found from the static loads first mentioned, to account for vertical oscillation, impact and other uncertain forces. It may be shown that less than this percentage added to the total weight supposed concentrated at the center of gravity of the car, taken in conjunction with the maximum possible horizontal force acting at the same point, will be sufficient to cause a load on any one journal twice as great as that due to static conditions alone; this fact, considered in connection with the location of the superstructure well above the truck springs, is believed to be a logical reason for reducing the stress increment from 100 per cent. in the case of truck members and body bolsters to 50 per cent. for the framed members of the car body above the transoms. As to the body bolsters themselves, while it is true that these parts of the underframe are also situated above the truck springs, yet it is evident that they are peculiarly liable to shock; and for the reason that the car body, though nominally supported by the center plates, is constantly rolling from side to side while the car is in motion, the body bolsters necessarily must be subjected to large and uncertain stresses arising from the frequent impact of the top and bottom side bearings.

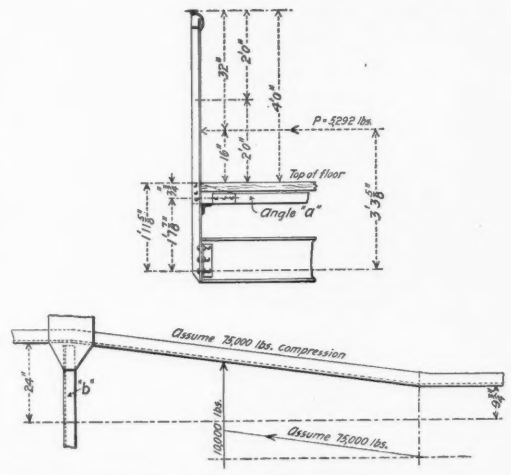
Moreover, in the design of body bolsters what is de-

Side Pressure and Side-Sheet Ties.

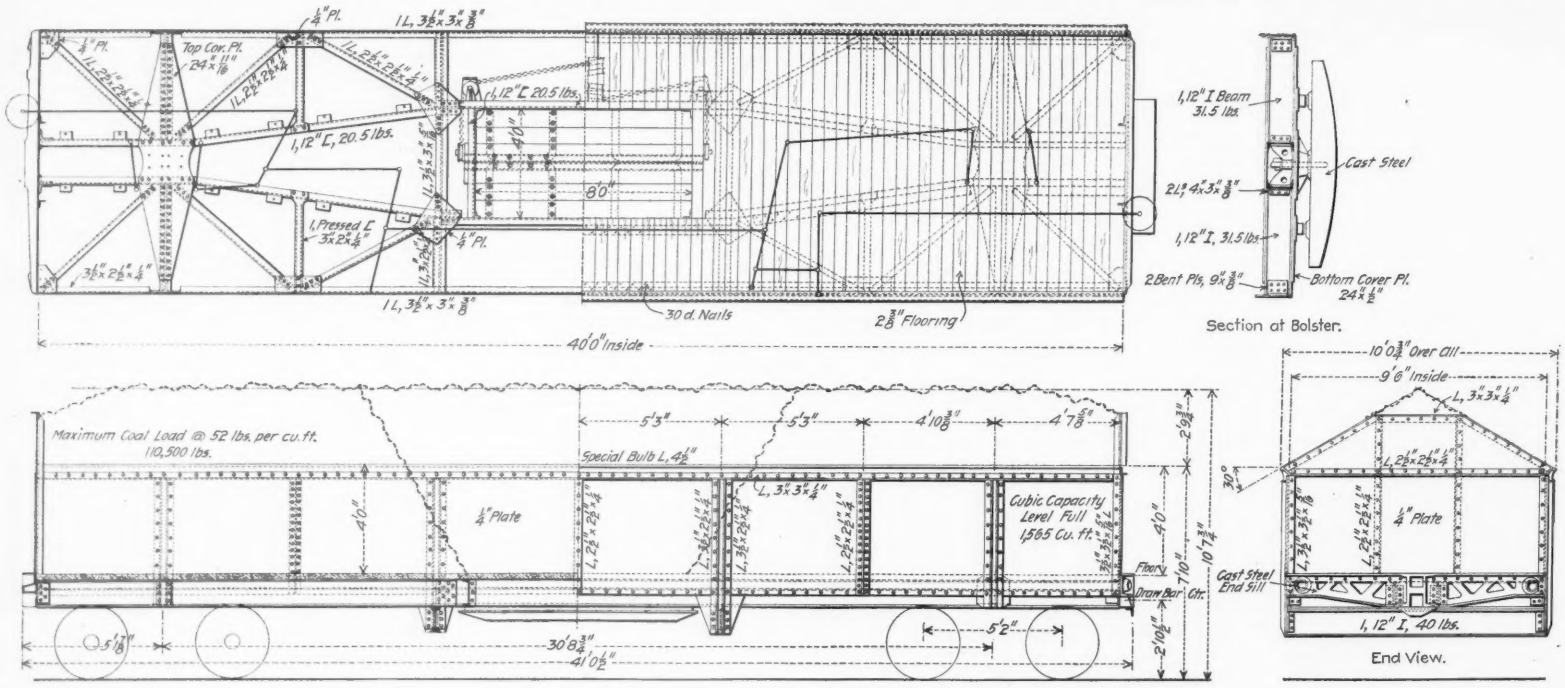
Area of unsupported side=4.0 x 10.5=.....42.0 sq. ft.
Weight of one cu. ft. of water..... 63.0 lbs.
Pressure (P) on sides=63 x 42.0 x 2.0=..... 5,292 lbs.
Stress in angle "a"=$\frac{5292 \times 3.302}{1.656}$=.....10,552 lbs.
Net area required, at 16,400 lbs. per sq. in.....0.64 sq. in.
1 L., 2½ x 2½ x ¼ in. net area 2 holes deducted..0.85 sq. in.

Center Sill Ties.

Stress in the angle "b"=10,000+10,552=..... .....20,552 lbs.
Net area required at 16,400 per sq. in.....1.25 sq. in.
One L,3½ x 3 x 5-16 in., net area 2 holes deducted..1.51 sq. in.



Load and Stress Diagrams—American Car & Foundry Co.'s Class S. G.-50 Gondola Car.



Load Diagram and Structural Views—American Car & Foundry Company's 50-Ton Gondola Car.

Assumed Loading.

"A. C. & F. Co.'s" Specifications, 1900.
5½ x 10 in. journals.
Base dead load..... 32,000 lbs.
Maximum live load.....120,000 lbs.
Weight of A. C. & F. Co.'s S-1 trucks..... 14,400 lbs.
Deduct weight of wheels and axles..... 8,400 lbs.

Weight of truck materials above axles..... 6,000 lbs.
Gross body dead load=32,000—6,000..... 26,000 lbs.
Deduct for bolsters, etc..... 1,300 lbs.

Net body dead load..... 24,700 lbs.
Assumed live load.....120,000 lbs.

Total static body load.....144,700 lbs.
Add 50 per cent..... 72,350 lbs.

Final uniformly distributed load.....217,050 lbs.
Final uniformly distributed load per sq. ft. of floor area..... 571 lbs.
Total floor area (40 x 9.5).....380 sq. ft.

Center Sills.

Maximum moment.....2 sills.... 42,200 ft. lbs.
S. required at 16,400 lbs. per sq. in.2 sills.... 30.8
Two 12 in. channels, 20.5 lbs.... ..... 42.8

Sides.

Maximum moment from uniform load, one side ..... 87,200 ft. lbs.
Maximum moment from concentrations, one side .....199,400 ft. lbs.

Total maximum moment, one side.....286,600 ft. lbs.
Flange stress..... 65,140 lbs.

Bottom Flange.

Net area required at 16,400 lbs. per sq. in..... ...3.97 sq. in.

One-sixth of net web area.....1.90 sq. in.
1 L., 3½ x 3 x ⅜ in. net area.....2.04 sq. in.

Total net area.....3.94 sq. in.

Top Flange.

Flange stress as before.....65,140 lbs.
Area required at 10,170 lbs. per sq. in.....6.40 sq. in.

One-sixth of net web area.....1.90 sq. in.
1 L., 3 x 3 x ¼ in.....1.44 sq. in.
1 special bulb L.....3.13 sq. in.

Total area..... .....6.47 sq. in.

Bolster.

Static load at end of bolster, plus 100 per cent... 51,300 lbs.
Flange stress.....198,800 lbs.
Net area required for top cover pl. at 15,000 lbs. per sq. in.....13.25 sq. in.
1 plate 24 x 11-16 in. net area.....13.94 sq. in.

Number of rivets required on each side=$\frac{198,800}{7220}$=

28 rivets..... ⅞ dia.

Floor Beams.

Maximum moment (one beam).....54,300 ft. lbs.
S. required..... .....40.0

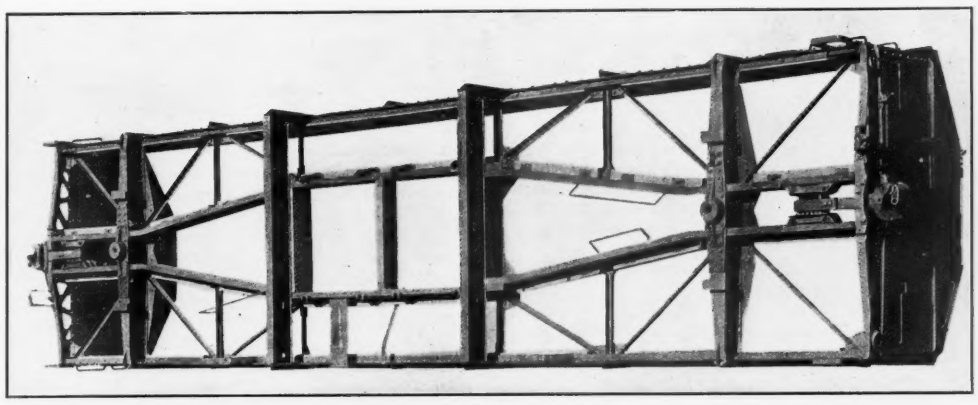
One 12 in. I, 40 lbs., S=.....44.8

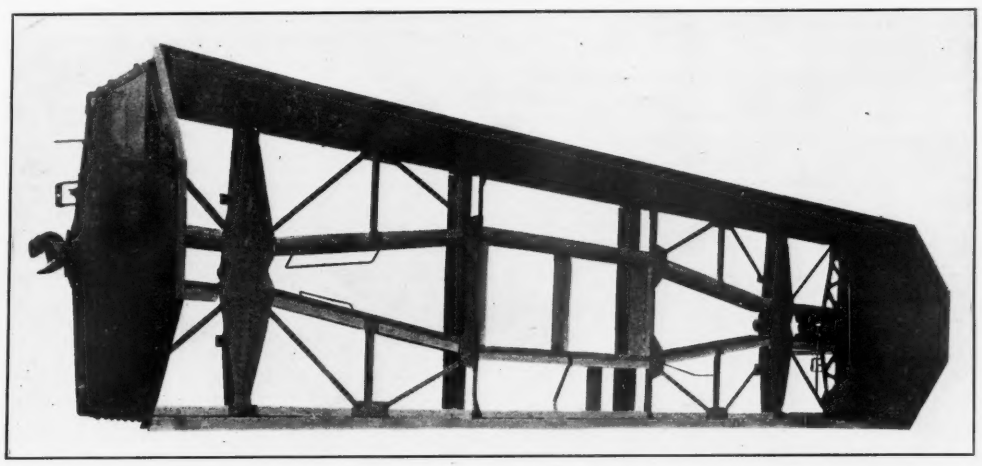
Car Complete.

Nominal capacity.....100,000 lbs.
Rated capacity .....110,000 lbs.
Maximum capacity .....120,000 lbs.
Estimated weight complete.....37,000 lbs.
Total door opening.....32 sq. ft.

sired is apparently less a safe *ultimate strength* than maximum *rigidity* of the parts, so that the addition of 100 per cent. to static loads acting upon these members is considered none too great to accomplish the desired result.

Attention is further invited to "unit stresses," as per Articles 18 and 19; these, it will be noted, are rational in form, and proportioned to the conditions of stress in the different members. These unit stresses have been worked out in general in accordance with the well known results of Wöhler's investigations of the Effects of Repeated Stresses, and when it is considered that in the first place the loading in the car body has been assumed unusually large, and that secondly, this loading has been doubled for truck members and body bolsters, while 50 per cent. has been added for body members above the bolsters, it would certainly seem that the unit stresses provided in





50-Ton Experimental Steel Gondola Car—American Car & Foundry Co.

Sections 18 and 19 are amply sufficient, and should be a guarantee of safety when intelligently applied.

To illustrate the use of this method of designing, attention is invited to the line drawings and photographs of a 50-ton structural steel drop-bottom gondola car with wood floor, that has been worked out on the basis proposed. The load and stress calculations in connection therewith are sufficiently clear to require no detailed explanations, and when it is observed that this equipment weighs but 37,000 lbs., and at the same time is fully able to haul 120,000 lbs. of paying freight (ore, lime, stone, etc.) the value of a judicious use of good methods is apparent.

Abstract of Specifications.

We can hardly publish in full the specifications referred to in Mr. King's communication, but give below a few items. The specifications are minute and elaborate, and we advise those interested in this subject to send for them.

All parts of the framed superstructure shall be made of rolled steel, except where considerations of dead weight or efficiency require different material.

All structures shall be designed to admit of exact calculation of the stress in each truss member and flange stresses in riveted girders and rolled beams.

Unless otherwise determined by given dimensions, cars shall be designed to provide flat space in accord with the following schedule of cubic feet:

Type of car.	Cubic space level full, per ton of rated capacity.	30 Ton Car. Cubic feet level full.	40 Ton Car. Cubic feet level full.	50 Ton Car. Cubic feet level full.
Box	64.0	1,920	2,560	3,200
Gondola	31.5	945	1,260	1,575
Hopper	36.0	1,080	1,440	1,800

In general, all superstructures will be designed upon the following basis of maximum static axle loads:

Axle journal	Total load per axle.	Gross superposed load per 8-wheel car.	Dead load per 8-wheel car.	Live load per 8-wheel car.
	Lbs.	Lbs.	Lbs.	Lbs.
4¼ in. x 8 in.	24,000	96,000	24,000	72,000
5 in. x 9 in.	31,000	124,000	28,000	96,000
5½ in. x 10 in.	38,000	152,000	32,000	120,000

To the stress in all truck members and body bolsters, as derived from the above static loads, 100 per cent. will be added for impact and vertical oscillation.

Arch bars are subject to special analysis, involving a maximum horizontal force due to curves, etc.

To the stress in each member above the body bolsters, derived from the given static loads, 50 per cent. will be added to account for vertical oscillation, impact, etc.

Unit stresses are given in five different groups for the various firs, pines and oak that may be used in construction, and unit stresses for metal are also given in detail.

No compression member should have a length exceeding 45 times its least width and no plates or rolled sections shall be less than ¼ in. thick, except by special agreement.

Rolled sections may be made of either basic open-hearth or Bessemer steel and plates must be of basic open-hearth. All steel castings shall be of basic open-hearth. The ultimate strength of steel castings shall be 60,000 to 70,000 lbs. per sq. in., elongation 12 per cent. to 15 per cent. in 2 in.

Malleable cast-iron shall have an ultimate strength of 30,000 to 40,000 lbs. and an elongation not less than 1½ per cent in 2 in.

Wrought iron shall have an ultimate strength of 45,000 to 55,000 lbs. and an elongation of 25 per cent. in 8 in.

Rivet steel shall have an ultimate strength of 48,000 to 58,000 lbs., elongation of 26 per cent. in 8 in., bend 180 deg. cold and have phosphorus not to exceed 0.05. The rolled sections shall have an ultimate strength of 52,000 to 62,000 per sq. in., elongation 25 per cent. in 8 in. and bend cold 180 deg. Phosphorus shall not exceed 0.05 in mild steel plates. For structural shapes phosphorus shall not exceed 0.07.

The Organization of the Illinois Central.

We have published recently a number of interesting exhibits of the organization of various railroads which we judge to be a matter of very considerable interest. April 27 appeared a chart showing the organization of the Pennsylvania Railroad, Aug. 31 another showing the Erie, and Dec. 14 still another showing the Lehigh Valley. Nov. 9 we printed a circular showing in considerable length the organization of the operating department of the Southern.

On the Illinois Central the office of Assistant General Manager has recently been created and the appointments and promotions consequent upon this appeared in our issue of Dec. 28. A circular dated Jan. 1 has been issued defining the duties of various officers under the new organization. It should be remembered that the Illinois Central has no General Manager, those duties being performed by the Second Vice-President. The circular follows, being reprinted nearly in full.

The duties of the Assistant General Manager, General Superintendent of Transportation, Assistant General Superintendent and Engineer of Construction will be as follows:

Assistant General Manager.—The Assistant General Manager shall report to and receive his instructions from the Second Vice-President; he shall have general charge of all construction work, maintenance of way and structures; he shall have general charge of the train and station service and general supervision of the preparation of time cards, and shall—subject to the approval of the Second Vice-President—provide rules for the safe and efficient movement of trains. He shall have charge of the equipment of the company; he shall be responsible for the proper discipline of the employees within his jurisdiction, for the safe and economical movement of the passenger and freight traffic and for the maintenance of the efficiency of the service and shall make and enforce such necessary regulations as will best secure the safe and economical operation and maintenance of the road. He shall perform such other duties as the Second Vice-President may assign to him.

General Superintendent of Transportation. — The General Superintendent of Transportation shall report to and receive his instructions from the Assistant General Manager. He shall be responsible for the proper movement of passenger and freight traffic, and shall have charge of the distribution of car equipment. It will be his duty to provide car equipment and arrange for the movement of special trains and see that regular passenger train service is efficiently and satisfactorily conducted. He shall have supervision of the freight train service and making of schedules for the same, subject to the approval of the Assistant General Manager. He shall see that cars are moved promptly, and that the most economical and efficient service is obtained from cars and locomotives.

He shall call for information and reports from officers and employees as may be required. The ordinary channel of his official communication shall be through the Superintendents, excepting that south of the Ohio River his orders shall be given through the Assistant General Superintendent. In case of emergency special instructions requiring prompt action can be issued direct to Train Masters.

He shall consult freely with the Superintendent of Machinery as to the temporary assignment and transfer of engines to the different Divisions in order to promptly move the traffic, and with the officers of the Operating and Traffic Departments generally as to the requirements of the service.

He shall order from contract mines the necessary supply of coal for the company's use and make the distribution of same.

He shall keep a record of the movement of all cars on this company's lines and an account of all the moneys that may become due for the use of its cars on foreign roads, and the amount due foreign roads for the use of their cars, and shall furnish such information to the Comptroller as will enable him to make settlement of these accounts.

He shall perform such other duties as may be assigned him by the Assistant General Manager.

Assistant General Superintendent.—The Assistant General Superintendent shall have jurisdiction over the railroads south of the Ohio River. He shall discharge all the duties and exercise all the powers of the Assistant General Manager which are necessary for the proper management of the several parts of the system under his jurisdiction. He shall be responsible to the Assistant General Manager and report to him, except as to matters pertaining to maintenance of way, as to which he shall report to and receive instructions from the Chief Engineer.

Engineer of Construction.—The Engineer of Construction shall report to and receive his instructions from the Assistant General Manager; he shall have charge of all construction work not otherwise assigned to the Chief Engineer, and shall perform such other duties as the Assistant General Manager or the Second Vice-President may assign to him.

Fast Run on the Burlington.

A fast run on the Burlington & Missouri River was briefly noted in our issue of Dec. 21. Official figures are now at hand. A special train of an engine and one car was run from Omaha, Neb., to Billings, Mont., 892.6 miles, in 983 minutes elapsed time, making an average speed of nearly 55 miles an hour, including all stops and delays. The train was run for a man wanting to reach his son at Billings, who was ill. The start was made from Omaha at 1:45 p.m., Dec. 14, and speed was reduced somewhat after the first 500 miles, on receipt of favorable reports of the son's condition. Billings was reached at 6:48 a. m. on the 15th. The time at some of the principal stations is given in the following and the stops and delays are indicated where shown by the reports, but in this respect the reports are not very complete.

Dist. from Omaha. Miles.	Stations.	Time. P.M.	Stops and Delays.
0.	Omaha	D 1:45	
			Ashland, 5 min.; Lincoln, 2 min. getting supplies for porter, Seward, 5 min. taking water; Aurora, 8 min. taking coal and water and cleaning fires; Cairo, 2 min. taking water.
178.4	Ravenna	A 5:04	Changing engineers and oiling.
		D 5:10	Anselmo, 7 min., taking water and oiling.
308.5	Seneca	A 7:15	
		D 7:22	
416.3	Alliance	A 9:43	Central time; change to mountain time.
		D 8:46	Changing engines.
			Crawford, 3 min., taking water; Ardmore, 1 min. taking coal; Edgemont, 1 min.; Clifton, 2 min., taking water.
571.4	Newcastle	A 11:42	
		D 11:46	
		A.M.	
647.9	Gillette	A 1:15	
		D 1:21	Changing engines.
749.4	Sheridan	A 3:20	Changing engines.
		D 3:23	
			Delayed 48 min. on account of hot boxes.
892.6	Billings	A 6:48	

The fastest time shown is that between Ravenna and Seneca, 130 miles in 125 minutes; and from this should be deducted a delay of 7 minutes at Anselmo, which would make the average running speed a little over 66 miles an hour. For speed and distance, this performance compares favorably with that of the special one-car train run by the Burlington from Chicago to Denver on Feb. 15, 1897.

Semi-Annual Report of the Sanyo Railroad of Japan.

This railroad is 276 miles long. It extends from Kobe, the chief port of Southern Japan, westward along the coast to Mitajiri, from which point connection is made by steamer with the extremity of the island, about 45 miles farther. An extension is projected to cover these 45 miles with a ferry across the strait of Shimonoseki.

The railroad reports semi-annually, and the report of Sept. 30, 1900, is the twenty-sixth. The railroad has stock outstanding to the amount of about 20 millions of yen. A yen is about the same as a silver dollar. The bonds are inconsiderable in amount. On this capital a

dividend of something over 700,000 yen was paid for the half year, the exact rate being 7⅛ per cent. per annum. To earn this rate, which seems high to us, the road was operated at an expense of only 37 per cent. of the gross earnings. Such a percentage would appear incredible were it not that details are given. The receipts were just short of a million and a half of yen, of which over a million was received from passenger traffic. The expenses of little over half a million were made up as follows:

	Yen.
Maintenance of way	103,664
Locomotive charges and repairs of rolling stock	235,823
Conducting transportation	157,353
General expenses	48,028
Total	544,868

Small as these appear in comparison with the earnings, they show an increase of 11½ per cent. as compared with the similar period of last year.

From the very low proportion of expense for Maintenance of Way and Conduction Transportation, as compared with the Motive Power expenses, it is evident that the wages paid railroad employees in Japan are very low and that it is the low wages that make the small operating percentage possible.

Certainly the percentage is not attributable to high rates, as we find the earnings per passenger mile only 1.2 sen, the sen being nearly our cent on the silver basis, and this low rate per passenger is received for traffic that must be largely local, the average journey per passenger being only 27 miles.

The freight business is comparatively unimportant, the freight earnings being only 20 per cent. of the total, but, although there is water competition, the earnings per ton-mile hold well up with the earnings per passenger-mile, being 1.06 sen, or 5⅓ mills per ton-mile. Comparisons are given back to 1897, from which we may judge that rates in Japan are fairly steady, and do not show the downward tendency that has prevailed in America.

The expenses are not shown either by passenger-mile or ton-mile. The train-mile figures are given, but are not separated into freight and passenger and are chiefly interesting as showing that about a million train miles were made in the half year, or ten round trips a day.

A balance is shown to credit of profit and loss of nearly 750,000 yen, but most of this amount was, as above, distributed in dividends. A payment of 37,300 was, however, made to a reserve fund which amounted to 334,800, so that although the profit and loss account after payment of dividend appears as only a bare two thousand yen, the Sanyo is not sailing quite so close to the wind as appears at first sight.

Water Softening Plant of the Cincinnati, Hamilton & Dayton Railway.

The water supply for the Cincinnati, Hamilton & Dayton, at Ottawa, Ohio, was formerly taken from the Blanchard River, but, owing to the contamination of the river by salt water from oil wells in that vicinity, it was decided to drive deep wells, and treat the water used to supply locomotives. Mr. C. A. Wilson, the Chief Engineer of the railroad, after an investigation, selected for the water softening plant the intermittent settling tank apparatus, made by the Wefugo Company, of Cincinnati, Ohio, and shown by the accompanying engraving.

At this water station the softening plant is limited by the flow of the well supply, which is at the rate of 5,000 gals. an hour and the plant is designed to fit this supply. The pumphouse is about 175 ft. from the river and two wells were driven, each about 130 ft. deep. These wells are about 225 ft. from the river. The pumphouse is a frame building 16 ft. wide and 45 ft. long, with a wing about 8 ft. x 10 ft., in which are located the two deep well pumps. In the basement of the main part of the house are two steam boilers, one horizontal steam pump, one filter tank, and a 5-h.p. stirring engine. On the floor above are three precipitating tanks, each 12 ft. 6 in. in diam. inside x 12 ft. 5 in. deep, having a net capacity of 10,000 gals. The tanks are provided with mechanical stirring devices, float pipes, inlet and wash pipes, and chemical tanks. One wooden elevated storage tank, holding 50,000 gals., is located up the track about 950 ft. from the pumphouse; from this tank the locomotives are supplied by two 8-in. standpipes.

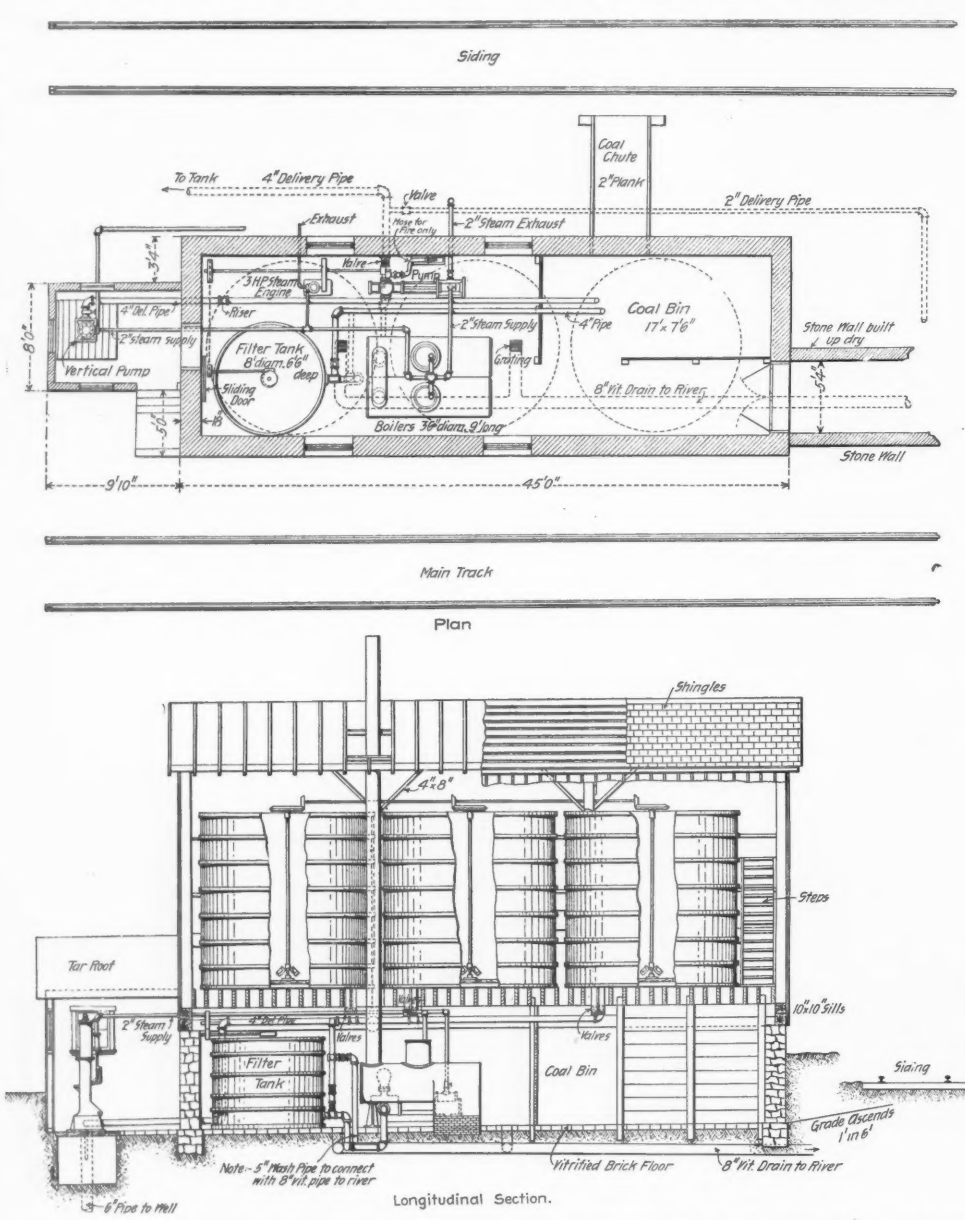
The rated capacity of the water softening plant is 100,000 gals. per 24 hours. Before it was installed one day and one night pumper were required, so no additional men are employed because of this addition to the station. The operation of the treating plant is as follows: The two deep well pumps fill the first precipitating tank with hard water, while the small engine drives the stirring device, mixing the water and chemicals. During this time the second precipitating tank is supplying softened water through the float pipe, to an 8-ft. gravity filter, from which it flows to the horizontal steam pump, and this pump forces it up the track into the storage tank. In the third precipitating tank the water is settling and clarifying. By the time the first tank is full, the second is empty, and the third is ready to use. The second tank is then pumped full, and while the supply is furnished from the third, the water in the first tank is allowed to settle. The water, after softening and after passing the mechanical sand filter, is perfectly clear. A tank is filled and treated every 2½ hours. Each precipitating tank is cleaned once a week, and the filter is cleaned once in from four to six days.

The washing process is simple as at no time are the precipitating tanks completely emptied. About 2 ft. of water is always left in them. In this water all the precipitated lime sludge collects, and after one week's run this sludge is about 6 in. deep in each tank. When the steam engine is started the stirring device mixes the sludge with the water, making a dilute milk of lime carbonate, which readily flows out of the tanks into the wash pipe, and then into the drain pipe running to the river. In this way the collection of a week is removed from a tank in about ten minutes.

The filter is washed by reversing the flow of water from a tank above, thus breaking up the sand bed. When it is properly liquefied the stirring device, which is driven by the engine, agitates the bed and cleanses the sand of the lime sludge it has removed from the water. The time consumed in washing the filter is about 15 minutes. No cleaning of pipes or chemical tanks is required with this type of softening plant.

A double pumping of the water is usually necessary where water softening plants are installed, whether the intermittent or continuous plant is used, unless it is possible to elevate the plant to such a height that the water will flow by gravity from the softening plant into the storage tank. The placing of all pumps, boilers and softening plant in one house, and on the same level, makes it easier for one man to operate the entire plant.

The advantages claimed for this arrangement are: First, the placing of the pumps and softening plant in the same house allows one man to attend to the whole station; second, by having a storage tank independent of the softening plant, a locomotive tank can be filled at the rate of 3,000 gals. per minute, although the softening plant and pumps have a capacity of only 70 gals. per minute; third, the placing of precipitating tanks on the floor above the filter and pump, permits the water to flow by gravity through the filter to the pump; fourth, by having three precipitating tanks, smaller pumps can be used and kept in continuous operation. The interval of settling takes place during the filling of the third tank.



Water Station at Ottawa, Ohio—Cincinnati, Hamilton & Dayton Railway.

The monthly cost of operating this water station is as follows:

Labor, 2 men, at $40.00 per month	$80.00
Coal for 2 pumps and 1 engine, per month	37.50
Oil, waste, etc.	2.00
Chemicals, for 3,000,000 gallons of water per month	48.00
Interest and repairs	30.00
Total	$197.50
Cost per 1,000 gallons for softened water in storage tank, cents	6.58
Cost of pumping 1,000 gallons raw water, cents	3.80
Cost due to softening 1,000 gallons, cents	2.78

The following is the analysis of water from the wells at Ottawa, made Oct. 1, last, the impurities being given in grains per U. S. gallon:

Silica	.40
Oxide of iron	.20
Carbonate of lime	11.60
Carbonate of magnesia	1.15
Sulphate of magnesia	7.59
Sulphate of soda	1.48
Chloride of soda	7.25
Total	29.67

The water has a trace of sulphuretted hydrogen when first it comes from the wells. This almost disappears before it leaves the softening plant; but an addition to the plant is now contemplated whereby this sulphuretted hydrogen will be entirely removed. This plant has been in operation since July 17, 1900, and the Superintendent of Motive Power, Mr. C. H. Cory, is making comparative chemical examinations of the treated and untreated water, to show the improved condition due to the softening process. He is also watching the mechanical effect of the softened water upon the locomotive boilers, and up to the present time the results have been very satisfactory. The softening plant is considered as good an improvement as has been made in a long time.

Preservation of Railroad Ties.

Mr. Chanute published in the September *Proceedings* of the American Society of Civil Engineers a paper on the present state of the art of preserving ties which we reproduced at some length at the time. It has been discussed in later meetings and below are extracts from the discussion printed in the December *Proceedings*:

Mr. Samuel Whinery, M. Am. Soc. C. E.—A great deal more importance attaches to the proper selection of the wood to be treated than has often been devoted to the matter, and he has no doubt, from observations, as well as from what Mr. Chanute states in the paper, that the careful selection of the timber and its proper preparation by seasoning before it is treated has much to do with the success of the process. In the case of paving blocks, there can be no question that properly selected wooden blocks, properly creosoted, will give much better results in all cases where untreated blocks would fail by natural decay before they are worn out by the travel over them; but it is very doubtful whether creosoting adds anything to the ability of the blocks to withstand the abrasion of travel.

From what one often sees in practice, it would seem that anything is considered good enough to creosote. That is, that almost any kind of wood, even if partly decayed, is all right if creosoted. The idea that creosoting is a cure for all the evils that wood is heir to is undoubtedly wrong. If great care were taken to properly select the timber, and to properly prepare it for the process, there would be fewer records of failure.

There are not many inspectors who can distinguish, when a tie is dressed and delivered on the road, whether it is of long-leaf yellow pine or bastard pine, that is, in appearance one merges so gradually into the other that it is sometimes difficult to decide. We know very well, though, that of a lot of ties put into a track at a given time, some will begin to fail in four years, more in five and many more in six years, and that some will last 10 years, and a few will last even 11 and 12 years. The conditions of use being practically the same, the difference in durability must be due to a variation in the quality of the timber.

Mr. Samuel M. Rowe, M. Am. Soc. C. E.—In regard to the creosote process, Mr. Chanute's observations in Europe seem to confirm the correctness of the position taken by the writer and many others in this country, that, owing to the difficulty of procuring suitable oil, and from its large and continually increasing cost, the process is virtually ruled out in this country, except, perhaps, in special work required to protect timber against the teredo. This is also true, in some degree, with the zinc-creosote process by Mr. Rutgers, of which process Mr. Chanute seems to think very highly.

In regard to the life of treated ties in this country, the experience on the Atchison, Topeka & Santa Fe R. R. and the Southern Pacific R. R., after 12 to 15 years, seems to fix the mean at 10 to 12 years, where the zinc-tannin process was used.

In this connection, the writer's experience may be of value. The original mountain pine ties were laid on a portion of the Southern Division of the A., T. & S. F. R. R. in 1880, and by 1886 the right of way was strewn with removed ties, or rather, with masses of rotten wood, having but little semblance to the ties originally laid. There was then a standing order that removed ties should be piled and shipped to the division points for locomotive fuel. Finally, the accumulation became so great and its unfitness for fuel so obvious, that many huge bonfires were the result. From this experience with untreated pine ties, a life of 4½ years was all that could be deduced. Some of these ties failed in the third year, and the company was face to face with a serious problem. In July, 1885, the Las Vegas Timber Treating Works were installed, and have been in almost constant operation since, but no systematic count of treated ties removed was made until early in 1897, since which time the company has worked quite carefully to secure a record. Although this record is too limited as yet for definite estimate, it furnishes a basis for a statement (by the laws of averages) by which the probable mean life can be estimated. On the assumption that the mean life is 12 years, it is found that of the earlier treated ties, not anything like the numbers that should have perished have been removed, so that it is proper to assume that 12 years is too low. The writer is informed that very many ties laid in 1885 are still in the track, and he would not be surprised to find some still in at the end of the twentieth year. To settle this definitely, however, will require the record of the next three or four years. We have, nevertheless, sufficient to show the marked contrast between the untreated and the treated ties, and there are frequent acknowledgments from the management that the substitution of the treated ties has resulted in marked economy. It should be further remarked, that the condition of the track is now very much better than was possible when untreated ties were being used, and that the treated ties, when removed, are in much better condition than the untreated, having still considerable sound timber remaining, whereas the untreated ties when removed are entirely gone.

The advisability of drawing high requirements as to the quality of the timber in this country is not clear. The tie supply in this country has been and will continue to be drawn from inferior woods; and even with the oaks, only the inferior portion is being made into ties, while the select portions go to other purposes. It is in consequence of these conditions that the soft and inferior woods, by the aid of treatment by which their lasting qualities are made greater than those of the best oak, will be sought. Thus is opened a much enlarged field of supply, together with a reduction in cost and a very marked reduction in the cost of maintenance.

Another point which may properly be noticed is the sawing of ties from large logs, which should make good ties on account of the superiority of the timber and its lasting qualities compared with the sap-pole made from the same kind of timber. The timber should last one-half longer at least, other conditions being equal.

Mr. Chanute mentions, as one of the conditions favorable to the life of the tie, the thorough drainage of the roadbed. In this country, in almost all cases, the treated ties are shipped directly from the works to the locality where needed, and are there racked, ready to be put in place. In the interval, they receive a certain, or rather, an uncertain, amount of drying, and are then put in track. In a dry climate this is not so important, but in a moist climate it is conceded that the ties should be quite dry before being placed. It would seem, too, that the effect of water on creosoted timber, while not so deleterious as on the chloride (as it only affects the lighter and less valuable parts of the oil) is still sufficient to demand attention.

The writer has under examination samples of paving blocks treated by the "Creo-resin process," furnished by the kindness of City Engineer Erickson. These blocks seem to be well impregnated with creosote oil, reinforced by a quantity of resinous pitch, and they have every appearance of being an excellent paving material. These, with similar untreated blocks, were immersed in water on Sept. 4, 1900, and have now been in 60 days. At 30 days the absorption by the treated blocks was only about 33 per cent. of that of the untreated, the resinous pitch exuding but slightly; but at the end of 60 days the absorption of the treated blocks had gained considerably, as compared with those untreated, and a large amount of pitch had come to the surface, appearing in large globules adhering to the blocks. So marked was this action that it was deemed desirable to extend the experiment another month, and note further its extent.

The most thorough permeation of the timber by the antiseptic is a fundamental part of the work, so far as the zinc-tannin or the Burnett process is concerned. The application of a stronger solution superficially will not make up for the lack of permeation, as it is not known that the chloride will diffuse in time. Steaming under pressure is the best and most effective means to secure through permeation, and it must be gaged or prolonged to meet the character and condition of the timber. Oversteaming sometimes will reduce the amount of absorption of the solution, but, on the other hand, the permeation will be more perfect.

The question of the injection of liberal quantities of chemicals is of great interest just now, when managers are looking to reduction of cost. The chemicals form the most costly part of the treatment, and, while it must be insisted that enough be used to get the best results, there is an extreme which cannot be passed without wastefulness.

In closing his valuable paper, Mr. Chanute says: "It cannot, however, be too strongly insisted upon that the work must be well and skilfully done, for, otherwise, the results are sure to be disappointing." This is most heartily emphasized, and it follows that skilful operators must be employed.

The writer is pleased to note that oak (presumably something like our white oak) is not barred out from the woods treated in Europe. Regarding the selection of tie timber, it seems to be axiomatic that "the better the timber, the better the tie it will make," regardless of treatment. Experience and reason show this, and if the life of an oak tie of the best quality can be prolonged but two years, it is economy to treat it. Taking the white oak tie as it runs, there is a strong probability of doubling its life. The objection that the oak will not absorb sufficient to do any good, is, in the light of experience, a mistake, and is illogical, when the nature of the process and its effect is understood.

Mr. Chanute's remark in relation to the exhaustion of the timber supply introduces a theme, the importance of which, in this country especially, should be impressed at all times. In the last 30 years we have seen such destruction of our great forests as seems appalling. With the exception of a small territory in northern Maine, some small areas in the South and the region of the extreme Northwest, the forests have been invaded and the most valuable timbers have been more or less cut away. In many cases, shameful waste and destructive fires aid in the devastation. The tie renewals amount to nearly 70,000,000 annually, to-day, compared with 4,000,000 required in France, and the ratio will increase as the mileage increases. Although our forests seem boundless, they are not so, relatively; and, at the present rate of consumption, the scarcity of cross-ties, now beginning to be felt, will soon be serious.

The Hudson River Tunnel.

The story goes that a committee of English capitalists will reach New York about the middle of January to inspect the Hudson River tunnel with a view to deciding as to what shall be done towards completing that work. We do not quite see why a committee should come over to inspect the tunnel, as the owners, or would-be owners of the property, are loaded with accurate information from the various engineers who have been connected with the work in one capacity or another in recent years. The latest plan that we have heard of is to complete one tube, with aqueduct terminals, and run a shuttle service of very small cars back and forth through that tube, it being much too small to admit two standard gage tracks.

Failures in the Draw and Buffing-Gear.

BY GEORGE T. GLOVER, *Assoc. M. Inst. C. E.*

The following extracts from *Proceedings* of the Institution of Civil Engineers, Vol. CXLI, 1899-1900, give an idea of the draft gear used in English practice:

The most frequent, although perhaps not the most serious, casualties to goods or mineral trains are those occurring in the draw and buffing-gear of the rolling stock. The arrangement of the gear used by many railroad companies, and approved by the clearing house for private owners' wagons, is shown in Fig. 1. The draw-gear is continuous and elastic, having laminated springs to take the buffing and drawing stresses, and a cradle with india rubber (*a*) or spiral springs (*d*) to render the drawbar elastic. Cotter-boxes (*b*) are used in a number

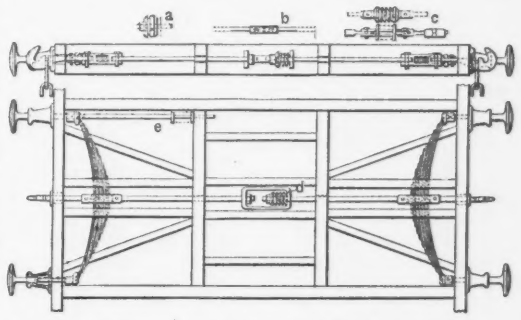


Fig. 1.—English Draw and Buffing Gear for Freight Cars.

of wagons (principally those belonging to private owners), and the "Bowles" method is also used, which consists in inserting a spring (*c*), thus avoiding the weight and the welding involved in the ordinary design of cradle. Any spiral or india rubber spring may be employed.

With the exception of a few fish and meat vans for use in passenger trains, the system of loose coupling is adopted, partly for convenience in coupling and uncoupling, but chiefly to enable the engine to start a heavy train with ease, by starting each wagon separately. The gear is thus liable to severe shocks during starting,

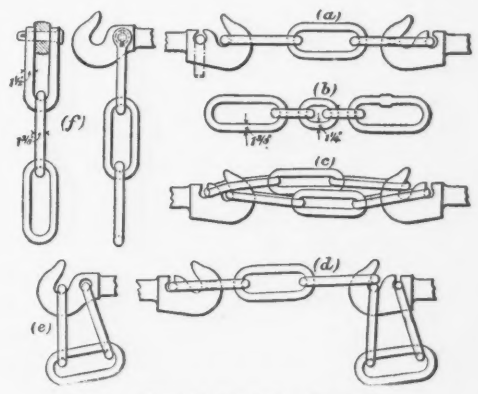


Fig. 2.—English Methods of Coupling.

stopping, and shunting. The failures in the buffing-gear are few and unimportant when compared with those in the draw-gear. Couplings are sometimes broken while running, as when a long goods train is turning the top of a bank, and the engine and the first few trucks commence to run down hill before the tail-end has crossed the top, thus throwing an additional stress on the couplings, causing a "break-away," when the rear portion either runs back or runs ahead, overtaking the front portion (which is being slowed up on the driver missing the remainder of his train), with serious damage to the rolling

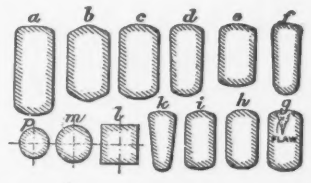


Fig. 6.—Sections of Hooks and Drawbars.

stock. Double coupling, Fig. 2 (*c*), may save an occasional "break-away," but it undoubtedly causes much breakage of couplings and hooks.

Causes of Failure.

Of the various causes of failure, rough usage may be considered the most frequent. The actual stresses induced by this cause cannot be reduced to exact figures, but the fact that couplings are in use, the links of which have collapsed between ½ in. and ¾ in., an amount which requires a total stress of 20 tons to 23 tons by a steady pull in a testing machine, indicates the severity of the sudden shocks on the draw-gear. The pull on the draw-gear when starting a heavy train is approximately shown by the following example: In a train of 40 wagons with a load of 10 tons and tare of 6 tons, and with a starting resistance of 20 lbs. per ton the weight of the train would be $40 \times (10 + 6) = 640$ tons, and the total resistance $\frac{640 \times 20}{2240} = 5.7$ tons. In tests made with a dynamometer van, however, the sud-

den jerk in starting a heavy goods train with loose couplings has produced a stress in the drawbar equivalent to a steady pull of 11.5 tons.

Wrought-iron buffer heads are often found to be indented by continual striking on the socket, so that the force on the buffing-gear to produce such a result must frequently be far in excess of the three tons to four tons required to overcome the resistance of the spring. Flaws are largely the result of rough usage, and are not easily detected when the wagon is in use, as the outside gear is exposed to the weather, which rusts over any slight crack, and the internal gear is not readily accessible. In some cases, in which broken material has been examined, the fracture has been so dirtied and rusted that the existence of a flaw has been doubtful. As a rule, however, in the case of sound material, the crystalline texture can be seen after the dirt has been removed.

Wear is chiefly noted in the draw-gear pins and eyes, in the ends of coupling links, and in buffer sockets. Crushing occurs in cotters and cotter-boxes, some of the latter being very light in section. Fatigue in the spring-steel results in loss of camber of the spring, and causes the rubber to become hard and inelastic. Faulty design is not a common cause of failure, the officials of the various railway companies having given thought to the working out of the details, and the private owners being tied down to a standard design approved by the Railway Clearing House. A large number of old wagons are in use, containing unsuitable parts, such as draw-hooks of small section, small drawbar eyes, and cotter-boxes. The great want of uniformity in these is shown by Fig. 6; while in use any of these hooks was liable to have the maximum force transmitted to it, although the sections varied as much as 50 per cent. Drawbar pins appear to be the weakest portion of the draw-gear, as in no other part is so much sound material found broken, but it is as well that, in case of overstrain, the gear should give way at a point such as this, where repairs can be easily and cheaply executed.

The relative frequency of failure of the various parts of the gear, out of a total of 2,900 failures, was as follows:

Couplings, 48 per cent.; hooks, 18 per cent.; drawbars 28 per cent.; springs, 4 per cent.; and buffing-gear, 2 per cent.

The Lighting of Trains.

On Dec. 21, page 843, we printed an abstract of a report made to the International Railroad Congress on the lighting of trains, which report covered all countries except Austria-Hungary, Roumania, Holland, Luxemburg and Germany. These latter countries were reported on by M. Banovits, Chief of Material and Traction of the Hungarian State Railroads. M. Banovits considers first, as a European investigator necessarily must, lighting by candles and by vegetable oil, concerning which we need say nothing.

Compressed Gas.—In 1869 the Prussian state railroads began the use of rich oil gas, which resulted at once in better lighting and simpler maintenance and care, but the development of gas lighting was slow. In 1876 it was taken up in Alsace-Lorraine, and so it slowly spread through Europe until 1896, by which time it was adopted on the Southern and North Western railroads of Austria, thus pretty well covering the Continent. No railroads that have introduced gas lighting have abandoned it, which is a conclusive proof that this mode of lighting is to-day, possibly not the best, but, at any rate, very acceptable.

A modification of this method of lighting was by the use of acetylene gas to enrich the compressed oil gas. Concerning the progress in this direction enough was said in our former article on this subject. It seems to be much the most general method of lighting on the Continent.

Electric Lighting.—The reporter says that notwithstanding the great advantages of lighting by compressed gas, it has certain disadvantages. The illuminating power is limited unless we carry the use of gas to extravagance. There is also danger of fire and explosion, and these disadvantages have caused the railroad companies to experiment with electric lighting. The initiative in this was taken by the Kaiser Ferdinand Nordbahn, of Austria, and by the Imperial German Postal Administration, both of which administrations began the experimental use of electric lighting by storage batteries, although the Austria state railroads were perhaps quite as early in the field with storage battery lighting for an Imperial train and the Hungarian state railroads tried electric lighting as early as 1892, using, so far as we can judge from the report, a motor carried on a special car. The example of these various administrations was quickly followed by experimental electric lighting arrangements by many Continental railroads.

Of course the well known difficulties of storage battery lighting quickly developed and indeed these are almost too well known to warrant repetition; namely, the weight of the cells, the great labor of handling them at charging stations, the considerable time necessary for recharging and the rapid deterioration of the plates.

The reporter, in summing up the advantages of electric lighting dwells on the greater security and upon the brilliancy of the lighting and its flexibility, but points out its great cost.

In the countries reported on, there were at the end of 1898, 63,462 coaches reported in this investigation. Of these, 17,000 were lighted by vegetable oil, 43,273 by compressed gas, either plain oil gas or mixed with acetylene; 1,135 by petroleum, 1,820 by electricity, two by acetylene.

Conclusions.—Lighting by electricity and by compressed gas stands in a class entirely apart from lighting by candles or oil lamps. The illuminating power is sufficient for all needs and electricity presents complete safety from fires and explosions. Only these two methods therefore need be considered. The use of the mixed gas (oil gas and acetylene) has the advantage over electricity of being cheaper, not only in running expenses but in first cost. On the other hand, electricity has the advantage of being safer, which advantage largely makes up for its greater cost.

Finally, the reporter concludes with an expression of his opinion that, having in mind the advantages of electricity, and especially its security, it is probable that electricity will be the ultimate method of train lighting. It will be observed that this reporter says nothing about axle lighting more than to mention in one phrase of two or three words the fact that he knows that there is such a method of lighting. Furthermore, his investigations do not seem to have been so extensive and so thorough as to have much technical value.

A Few Words About Paint.

Mr. W. H. Loomis, President of the National Paint Company, has prepared and will shortly publish a little pamphlet which he calls "A Treatise on Protective Coverings for Metal Surfaces." A few extracts from that document appear below and we publish it as embracing the accumulated knowledge of a very successful manufacturer.

The preliminary tests made by Messrs. Berg, Greiner, Toltz, Buck, and McDonald were not conclusive, for the reason that they were short-time tests, and the laboratory test is a short cut; as it is impossible to bring to bear all the destroying agencies which are to be encountered in practice. There are five recognized standard pigments, viz., oxide of lead (red lead), oxide of iron, carbon, graphite and asphaltum. These are used in combination and mixtures for metal protection. In vehicles linseed oil, turpentine, compound oils, and japans, are all used for grinding, thinning and drying purposes. All of the above pigments and vehicles have their value and uses, but it requires great care and intelligence to know how to make a satisfactory protective covering out of them. The writer set out, and has sent out to others who desired to make time tests, many samples of paints of different mixtures, with the express purpose of demonstrating which of the above pigments and vehicles are the best. Long-time weather tests are what paints receive in actual practice, and are much more conclusive than the laboratory or experimental tests,

In 1897 the writer had painted several iron plates 10x12 with three coats of paint each of nine of the then leading paints on the market; they were red lead, red oxide of iron, brown oxide of iron, carbon, graphite, carbon with an inert filler, litharge and charcoal carbon, red lead and graphite and a leading asphalt varnish paint. They were exposed to the weather, and carefully examined from time to time. The first and second years it would be difficult for any one to judge which was the superior, but at the end of three years some began to decay.

In November, 1900, after three years and a half exposure, I brought the plates to New York and showed them to several of our most prominent civil engineers, whom I asked to pass judgment upon their relative merits without knowing which was which. They unanimously pronounced the red oxide of iron, and the carbon filled paint the best. Red lead, and litharge and charcoal carbon comes next in merit, the graphite and asphaltum having begun to decay.

Early in 1898, The Osborn Co., Civil Engineers, Cleveland, Ohio, made one of the most careful tests of some 25 different kinds of paints, pigments, vehicles, varnishes, etc. They painted some 250 different metal plates, and made five different exposures that lasted from three to sixteen months, viz., brine, acid fumes, weather, flat and upright, depot (that is hung in the Union Depot train-shed where locomotives stand and in such manner that the plates would receive the blast at starting). A careful inspection of the Osborn report shows that the oxide pigments are the best, as an oxide of iron is marked perfect on four exposures, and good on the fifth or acid exposure. Oxide of lead (red lead) comes next with three marked perfect and two marked very good, all tests were two and three coats of paint. Their summary is as follows:

The superiority of three coatings over two is thought to be very clearly shown by the tests.

The one sample of Lucol oil paint shows no superiority over (if indeed equality to) the linseed oil paints.

The asphalt varnish paints hardly prove equal to the oil paints, as a great majority of the coatings contained linseed oil for the vehicle.

Of the pigments employed none show any decided superiority. Lead, oxide of iron, carbon and graphite all give results which average about the same.

In November, 1897, Mr. Ira O. Baker, Professor of Civil Engineering, University of Illinois, with one of his students, Mr. F. W. Von Oven, made tests of 12 different kinds or make of paints. Mr. Von Oven presented his thesis for the degree of Bachelor of Sciences in Civil Engineering the following June, with a table of tests that had been made in the laboratory, consisting of the following: Heat, salt water, sulphurous acid gas, nitric acid gas, relative elasticity. This was published in the *Railroad Gazette* of March 10, 1899.

His table of tests, as published at that time, shows conclusively that the asphalt paint was much the best, as proved by five laboratory tests, as in four of them it stood No. 1 and in the fifth, the salt water test, No. 2. They also made a long-time weather test of the 12 paints received. After an exposure in the open air and weather of two years and eleven months, they were examined on Nov. 20, 1900. The red lead and Williamsport iron oxide showed no rust spots on either the first or second coats, while all the others showed rust badly and especially the asphalt paint. This proves that the long-time weather tests are the only tests of any value in general practices, and that the laboratory and other short-time tests are of no value and are misleading. A review of these tests and experiments is conclusive of the following results and suggestions.

1st.—That the chemist is not necessarily a paint expert. His mission is to analyze and find if the proper materials are used, also to hunt for adulterants.

2d.—That the laboratory test is not practical or conclusive, for it often deceives us as it is generally much more severe than are natural conditions.

3d.—That longtime weather tests are conclusive, for they meet conditions that are encountered in actual practice.

4th.—That the oxide family of pigments, oxide of iron, oxide of lead (red lead) are the best pigments.

5th.—That carbon comes next, and indeed is an equal if improved with a mixture of some inert filler such as litharge; oxides and silica, which give it the same body and opaqueness.

6th.—Graphite and the asphaltum varnish paints come next, in their order, as the former can be improved in the same way as carbon, while for underwater or underground, electrical or hydraulic construction, the asphaltum varnish paints have no equal.

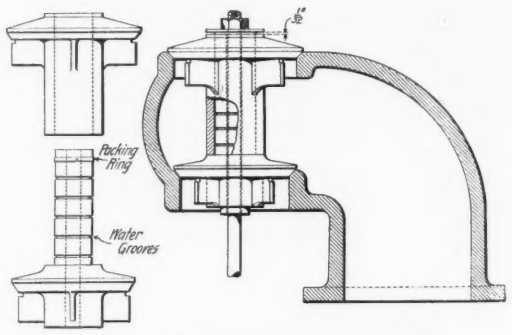
7th.—I would classify for a weather paint as follows: The oxides as perfect; the carbons as very good; the graphites good, and the asphaltum varnish paints, fair.

8th.—That old process, raw linseed oil, and a pure turpentine japan are the only vehicles to be used or worth considering.

9th.—That it requires thought, labor and study to produce satisfactory pigments, vehicles and metal protectors, and that when the finished product is obtained quantity is as prime a factor as quality; in other words, that new work should receive not less than three coats of paint, while four is better. Sir Benjamin Baker, Engineer of the Forth Bridge, which had 145 acres of painting surface, had four coats applied (all oxides), and Mr. L. L. Buck, Engineer of the New East River Bridge, proposes to have the same number of coats applied to that structure.

Chambers' Compensating Throttle Valve.

The Central Railroad of New Jersey has adopted as standard a sectional throttle valve designed and patented by Mr. J. S. Chambers, Master Mechanic, at Elizabethport, N. J. This design is intended to adapt itself to irregular expansion of the throttle valve, or of the throttle pipe. It recognizes the well-known shop practice of insuring the seating of the lower head of the throttle valve, on which it is usually hardest to maintain a tight bearing, and also makes more certain the steam tightness of the top seat. In seating the ordinary throttle valve these results are best attained by grinding both seats to that which would be, normally, a satisfactory bearing, and then easing off the top joint, by further careful grinding, until the bottom contact is "hard" and the top head of the



Chambers' Compensating Throttle Valve.

valve can be very slightly shaken on its seat in the throttle pipe. The success or failure of this method of grinding a solid valve turns upon a difference equal to the thickness of a sheet of thin paper, strips of tissue paper being sometimes used for the seating test. The difficulty of getting a proper bearing on both seats is generally known, and, aside from that, having carefully made tight seats while the parts are cold in the shop, there is no certainty that the seats will be tight under steam. We have known throttle valves to satisfactorily stand a cold-water test gradually merged into a hot-water test, and, to go immediately into the roundhouse and leak so badly under steam as to require repeated regrinding. Such an instance is perhaps exceptional, but it indicates that sometimes there are casting strains in valve or pipe which do not manifest themselves until the parts are thoroughly heated. The purpose of Mr. Chambers' valve design is therefore commendable.

From the illustration that appears herewith, it is apparent that the valve is made in two parts, with the usual wings on each head, and that the body of the valve is composed of two sleeves, which are fixed parts of their respective heads. The sleeve extension of the upper head encircles the sleeve of the lower head, and is of a

length that brings them shoulder to shoulder at the lower head when the sleeve of the lower head projects 1-32 of an inch above the top of the throttle valve. This gives the normal length from seat to seat. The throttle bolt passes through the center of the valve as usual and is crowned by the customary washer and nut at the top. The upward extension of the lower valve head has water grooves and, if desirable, a packing ring to prevent leakage, as shown. It is plain that under steam the two valve heads, like those of a common valve, will come in contact with the throttle seats at once, provided there has been no distortion from the original grinding. If, however, because of heat distortion, the valve seats vary slightly from alignment, perhaps having also increased the vertical distance between them, the lower valve head is free to adjust itself and to travel, moved by the throttle lever, the whole or any part of the clearance, 1-32 of an inch, between the upper part of the throttle valve and the washer under the bolt head. The difference from distortion is not likely to reach that limit.

This valve has been tested on the Central of New Jersey about a year, without having any repairs made to it. It is, therefore, stated with confidence by the inventor that valves so made will remain tight between the periods of general overhauling of engines. It is evident that a large measure of the expense and trouble caused by leaking throttle valves should be saved if further tests show no unfavorable features. Leaking throttles and their necessary allies, open cylinder cocks, are expensive adjuncts of locomotive operation.

Telephone Train Despatching.

BY G. F. J.

All railroads use telephones more or less, but few use them for despatching trains. There are various reasons for this, chief among them the fact that all our railroads are well equipped for telegraph train despatching, both in men and material, and the rules have so grown as to seem better adapted to telegraph than to telephone. Add to this the influence of the great band of telegraphers, the economical objections and the mechanical difficulties to be overcome, and there is little wonder that so few trials of the telephone in this service are made. Beyond all this there is an almost complete confidence in the accuracy of the telegraph, as opposed to a distrust of the accuracy of the telephone that is hardly justified by the facts, and that is taking many years to overcome. This distrust was born in the old days of imperfect transmitters, grounded circuits and poor service, and though it is lulled by a daily use of modern equipment, it is waked again by each connection with a noisy line, and by each telephone misunderstanding.

We should remember that with modern equipment there is no mechanical superiority, from the point of view of accuracy, in the telegraph over the telephone. Indeed, mechanically the modern telephone has two advantages over the telegraph. It needs no adjustment, and it works as well or better in wet weather; whereas the telegraph relay must be frequently adjusted and telegraph difficulties in wet weather are chronic and proverbial. It is to be doubted if the officers who now distrust the telephone would have so much confidence in the telegraph if they were brought into personal contact with refractory telegraph circuits, just as they are with refractory telephone circuits. Indeed the telephone is sometimes at a disadvantage because it continues to work in situations where the telegraph would not work at all. If one of your telephone wires breaks, and the ends ground you will have more or less noise on the line—generally more—but you will still be able to talk, though probably in a very uncomfortable fashion, and you will be condemning the telephone because it works so ill, under circumstances where the telegraph would not work at all.

The only way to kill this distrust of the telephone is to enforce with it the precautions which a long experience has taught us to use with the telegraph. No one thinks nowadays of making a train order effective before it has been repeated back and made "correct." If this simple precaution is observed with the telephone it can be relied on as absolutely as the telegraph. Indeed, there is no good reason why our standard code of rules should not be adopted with slight emendation for telephone work. This has been the experience of the railroads that are despatching trains by telephone, and all of them are very careful in having train orders repeated back before they are made "O. K." There is no difference in principle between telegraph despatching and telephone despatching, where the telephone simply supplants the telegraph, as provision can be made for all the usual paraphernalia, the reports of trains passing certain points, the train register and all.

On a number of roads, however, we have an essential change of method. With these we have the despatcher on the one side and the conductors on the other, with no intermediary agent or operator. Indeed, where the system is carried out to its fullest extent there is no one else on the line. There are telephones at each siding and station, but there is no one to man them unless a train comes along, and that train will not report unless it has orders so to do. Now if a despatcher is to work his division to advantage he must have frequent reports of his trains as they pass given points; but to get such reports under this new method he must stop his trains. It follows that this method is only adapted to slow-speed lines where trains can be frequently stopped without grave disadvantage. It is therefore well adapted to coal roads like the Huntingdon & Broad Top Mountain, which has worked in this way in part for many years.

On the part of safety this system would seem to leave little to be desired. In practice we may suppose that on a busy road each train will stop at nearly every siding and get orders to run to the next. This would amount to a rough block system with all the blocks worked telephonically by one man. If the orders are properly repeated back by the conductor and made correct there is no chance for misunderstanding, especially when a duplicate is given to the engineer. But this idea is elaborated upon in some cases by additional devices intended to diminish the chance of error. On some roads the conductor receives the train order and writes it out, while the repeating back is done by the engineer, who receives the "correct." On others, two telephones are provided at each point, in adjacent booths. The conductor and engineer each enter a booth and each write out the order, and each must repeat it back accurately before it is made correct. It is not very clear why this latter requirement is necessary. If the conductor takes down the order in duplicate, repeats it back and gives the engineer a copy we have all the precaution of a 19 order, while if the engineer repeats it back as well, we have what amounts to a 31.

The experience of the railroads using the telephone in the way described is to the effect that train despatching by telephone is safe when proper precautions are taken, and when the telephone line and instruments are modern and in good condition. This positive evidence should be taken as conclusive against the suspicions of the others. The advisability of a change is of course another question. The system is especially adapted to new and poor railroads and branches, roads where it is cheaper to run trains slow than to fully equip the stations with operators day and night. It would seem also to be well adapted to night work on lines that cannot afford to maintain night telegraph offices.

There is no physical reason why on such a line a couple of telegraph wires could not be so connected up that at 6 o'clock at night every office could throw a switch and change from telegraph to a telephone circuit. Then all the agents and operators would go happily home and the night dispatcher could in all probability get much more freight over the line with a telephone at each station than he can by telegraph with an insufficient number of night offices.

The chief theoretical difficulty with this arrangement is that when you have once given a train an order there is no stopping it until it arrives at the point at which it was ordered to report. It will sail along like a ship at sea till it reaches port. This will, of course, make the dispatchers prone to order all trains to stop frequently to report, which is only another way of saying that this system is adaptable only to a low speed road.

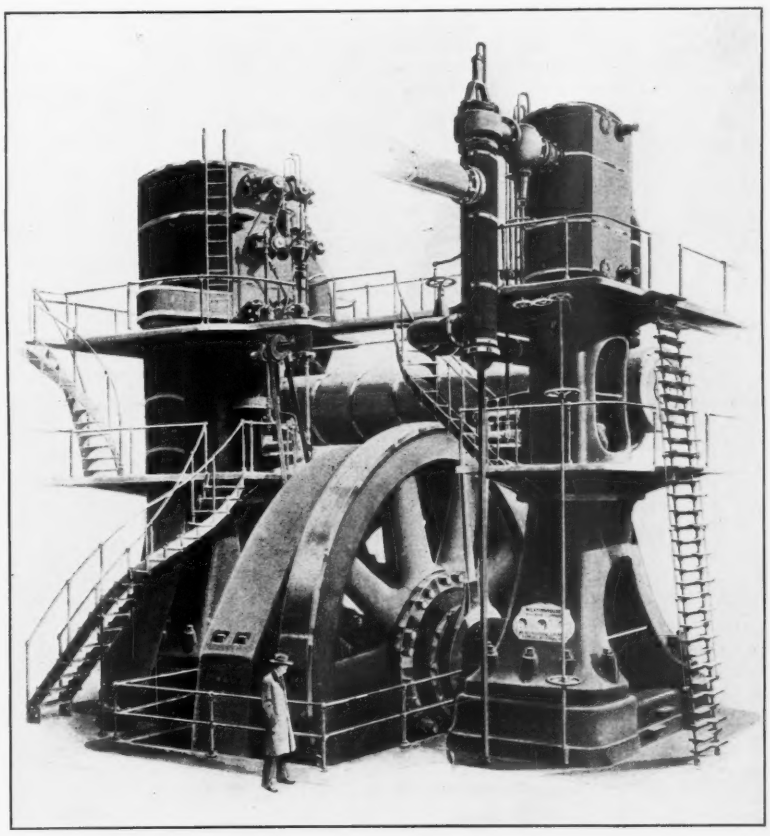
Whether the standard roads will adopt the telephone for train dispatching is another question. To tell the truth, as block signals come in, the train order shows signs of going out. The train dispatcher is just as important as he ever was, but he issues his orders rather to the operators than to the conductors, and the operators use signals to get the trains around each other without stopping them. Possibly by the time the standard lines are ready to entrust the telephone with train orders they will have no more train orders to telephone.

Westinghouse-Corliss 5,000-H. P. Engines.

The Westinghouse Machine Company has recently built two vertical, condensing, cross-compound engines of 5,000 h.p. each, for the Kings County Electric Light & Power Company, of Brooklyn, N. Y. One of these engines is here illustrated, as it appeared when temporarily set up, at East Pittsburgh. The engines were especially designed by Mr. Cyrus Robinson, of the Westinghouse Co., for driving alternating current generators mounted directly on the shafts of the engines. They have a nominal capacity of 4,000 h.p. and will carry overloads up to 7,500 h.p. The principal dimensions of the engines are as follows:

Height from floor line to top of cylinders, about 35 ft.; length along the shaft, 38 ft. 6 in.; width, 28 ft.; diameter of high-pressure cylinder, 46 in.; diameter of low-pressure cylinder, 86 in.; stroke, 60 in.; revolutions per minute, 75; steam pressure, 180 lbs. The diameter of the shaft at the wheel-fit is 39 in.; diameter of shaft at bearings, 34 in.; length of journal bearings, 60 in.; total weight of the shaft, without crank cheeks or flywheel centers, about 75,000 lbs. The shaft is of hydraulic forged open-hearth steel, and is hollow its entire length, the hollow space being 16 in. in diam. The flywheel has 100 tons in the rim, and the diameter is 28 ft. The velocity of the rim will be 6,600 ft. a minute.

There is room left between the cylinders for a Westinghouse generator, which will furnish current for both light and power. The revolving part of this generator is mounted directly on the steel shaft of the engine, and is bolted to the flywheel. The reheating receiver is shown in the illustration, and there is also an improved form of Corliss valve-gear. The journal bearings and guides are water-jacketed. The generators have an output of 2,850 k.w. each, giving a 3-phase current of 250 amperes in each phase, at 6,600 volts, with 3,000 alternations per minute. They have separately excited fields and operate in multiple with other Westinghouse units. The bedplate of one of these engines weighs over 43 tons and is cast in one piece. The flywheel is built up in segments.



Westinghouse-Corliss 5,000-H. P. Engine.

The company for which these engines were built was chartered in 1890. Later, the charter was taken over by a Mr. A. H. Young, of Waterbury, Conn. By January of 1898, 82 miles of conduit had been laid. In 1898 the Gold street station of the company was begun, and this was equipped with Westinghouse generators. Both this and the new Bay Ridge station are of modern fireproof construction, with foundations of concrete on top of piles. Landing docks have been built close to the stations, for handling coal and ashes, and the most approved modern station methods have been adopted. The Bay Ridge station, to which the new engines are to be shipped, has now in use about 5,000 h.p. of generating apparatus, and when the two new 5,000 h.p. units are installed it will be one of the largest in the country.

Besides the two engines described above the Westinghouse Machine Co. is building a large number of similar and even more powerful engines, among which are 16 engines of 5,000 h.p. each for the Third Avenue line of the Metropolitan Railway of New York; two engines of the same capacity for the Boston Elevated; two engines of 1,500 h.p. for Manchester, England; and eight engines of 6,500 h.p. for the new Waterside power plant of the New York Gas, Electric Light & Power Co.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advetising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

December was another notable month for the cars and locomotives ordered. Our records show that orders were placed for 18,431 cars of all kinds and 429 locomotives. This is the largest number of locomotives ordered in any month last year and the largest number of cars, excepting in November, when the orders amounted to something over 20,000. The December car orders are divided as follows: Box, stock and refrigerator cars, 10,158; coal and ore cars, 6,045; flat cars, 1,950; tank cars, 43; and passenger cars, 235. Of the locomotives 133 were for passenger service, 263 for freight and 33 for switching service.

Readers of the *Railroad Gazette* will remember that Mr. Carter, Chief Engineer of the Chicago & Northwestern, made for the International Railway Congress, held at Paris last September, a thorough and lucid report on automatic block signaling in this country. This report was published in our issue of January 12, 1900. The reports of the Congress now being published by the French technical press would seem to indicate that, so far as any formal action is concerned, Mr. Carter's work failed to produce much result. The "conclusion" of the Third Section of the Congress on track circuit signals for the automatic operation of the block system is that there are theoretical advantages, but that it would be premature to render definite judgment before knowing (1) the results of extended experience on the great European railroads, and (2) the influence which track insulation may have on the stability of the permanent way, whether it interferes with maintenance work or the rapid replacement of rails; and in the event of the adoption of election traction, with energy taken through the rails, whether the two—a signaling current and a power current—could be worked together. In other words, Mr. Carter set forth the results of experience on American railroads, extending over seven years and dealing with hundreds of signals, under varying conditions, and now the Continental railroad officers solemnly resolve that this experience is to them of no value; they must have the experience themselves before they will venture to have, much less to express, any decided opinion as to the usefulness and economy of automatic block signals. As Mr. Carter's paper was fortified with statistics of service, and as his own opinions were strong and decided, we must conclude that in this matter, as in some others, the meetings of the Congress were more or less abortive because of the difficulty of diverse tongues and the preoccupation of the members in attendance. With few men at any meeting who were warmly interested in any one topic, this unprofitable result was almost inevitable. At least one well-posted American who speaks French was present at the meetings which dealt with signaling, and could have answered any questions put by members who were not convinced by Mr. Carter's statements; but a large audience, not particularly interested, would of course put a damper on any intelligent discussion.

While, therefore, the prospects of automatic signaling on the Continent are not particularly bright, the railroad men of England are beginning to show signs of appreciating its importance. Possibly the increasing pressure of American competition in locomotives, machinery and other manufactures, which has lately exercised the minds of a good many Englishmen, has something to do with this awakening. At all events, it is reported that the London & South Western is to try some automatic block signaling, and the automatic apparatus which has been used now a number of years on the Liverpool Overhead road is spoken of as successful. The introduction of power interlocking, which has been begun on three or more English railroads, will be likely to turn the minds of signal superintendents to improvements in block signaling. It is true that the English cannot make half so great a saving by the use of automatic block signals as we have made, because yards, requiring a switch tender, are so much more frequent on their roads than on ours; but the possible saving is quite appreciable, nevertheless. The only real difficulty of a practical nature which the automatic track circuit has to meet in Europe is the metal sleeper. These ties are used to some extent on the Prussian state railroads, and the man selling automatic track circuit signals probably may as well decide at once not to waste his time on railroads of that kind. The wire circuit signal is by no means dead, however; and with the advances made during the past few years in cars, engines, couplings, brakes and train management, no one should assume that the track circuit is the only available block signal telegraph. But there are many thousand miles of track in Europe laid on wooden sleepers, very much the greatest part of the mileage in fact, and the automatic signal ought some day to find a field in that country. We understand that the one Continental railroad which has introduced automatic signals, the Paris, Lyons & Mediterranean, has expressed satisfaction with them. These are American signals. The question of using track circuit signals on railroads worked by electric locomotives is, in our opinion, rather academic, and the member who raised it in the Congress probably meant it as such. So far as anyone can see at present, electric motive power is not going to be extensively used except on railroads where trains are very frequent, as on the great city passenger railroads of London, New York, Berlin, and Paris; and on such railroads the signaling problem is quite different from that on the ordinary railroad of to-day.

The Danger of the Lap Joint.

The boiler explosion, Dec. 3, which wrecked the power house of the Chicago & Northwestern, at Chicago, is found on an examination of the plates to be chargeable to the longitudinal lap joints. The danger attending the use of these joints is generally known, and the lap construction has been abandoned for locomotives, yet cylindrical boilers for stationary purposes are now very often built in this way. In fact, we believe it is rather the exception for cylindrical stationary boilers to be made with butt joints and cover plates as in locomotive practice. The analyses of the plates of the boiler which failed in the Chicago & Northwestern power house are said to show high phosphorus, but in the nature of things it would seem to be merely a matter of time for lap joint boilers to crack near the horizontal seams, and in a place where a defect is difficult to find. That these fractures are not always found is shown by the number of boiler explosions caused by a fracture of the plates along the horizontal seams beneath the lap. One of the largest boiler insurance companies tells us that about 90 per cent. of the explosions of cylindrical boilers, coming under its notice, are caused by the sheets cracking near the horizontal lap joints, as in the case of the Chicago & Northwestern boiler. These boilers are continually giving way at the lap in spite of the closest inspection.

Doubtless the reasons for continuing the use of the lap joint lies in its cheapness, and the ease with which plates can be joined in this manner. But the objections to the lap joint for horizontal seams should outweigh these. In shaping up the plates the edges which make the lap are usually hammered over, which no doubt weakens the material at the most vital point, and further the lap joint throws the shell out of round with the result that the boiler tends to change its shape under change of pressure. On account of the stiff section at the joint the strains in the sheet, due to changes of pressure, are concentrated a little beyond the lines of rivets and just about where the plates have been most distorted in bending. It is plain to see that stresses set up in this way near the joint may easily start a crack under the lap which cannot be detected until it extends through to the inner surface of the shell. Of course, the conditions are made much worse if the rivet holes are punched and the workmanship is poor. If cylindrical boilers are to be used the remedy is to avoid lap joints in the longitudinal seams, and insist on butt joints and cover plates and good workmanship.

Tonnage Rating on the Southern Pacific.

A bulletin of the American Railway Engineering and Maintenance of Way Association contains a full explanation of the method used on the Southern Pacific, since July 1 last, to calculate the rating of locomotives. Certain fundamental assumptions have to be made, and probably to many it will not seem so practical or satisfactory a way as to rate engines by the result of actual trials, preferably with a dynamometer car, as was done several years ago on the Northern Pacific.

The basis for these calculations includes: Wellington's values for train resistance of cars between 10 and 35 miles an hour; the relation between train speed and piston speed in terms of the length of stroke and diameter of drivers; average curves of mean effective cylinder pressures as determined by the experiments on the road; and the well-known equation for traction based on cylinder power. The unit of traction in this case is taken to be the cylinder capacity capable of giving a tractive effort at the rail of 1,000 lbs. at a speed of 10 miles an hour. With these data a table is prepared showing the loads which can be hauled per unit of power, at speeds from 10 to 46 miles an hour and on different grades, both ascending and descending, by the particular class of engines used as a basis of the rating.

With the aid of this table what are called "operating" profiles are made for each division, taking into account the actual grades, with allowances for curvature and velocity heads due to the speed at different points. Wherever practicable an operating profile is plotted for maximum and minimum loads per unit of power and the average speed determined. These speeds and loads are again plotted as time-load diagrams, their curves determined and intermediate loads and velocities interpolated and a table made for all loads and velocities within the limits assumed. From these diagrams and tables the engine ratings of the standard locomotive are selected having reference to the desired running schedule; the ratings of other groups of engines are made proportional to their relative capacities as compared to the standard engine at corresponding train speeds.

The chief advantage of this method seems to be that the element of speed is made prominent and data are at hand to modify ratings when it becomes necessary to change the schedule of freight trains.

Mr. B. A. Worthington, who has charge of tonnage rating on the Southern Pacific, discussed this system at a late meeting of the Pacific Coast Railway Club and pointed out a few defects in the method which can be avoided by any one adopting this plan. The first is that the table showing the load hauled for each unit of engine traction should be based on piston speed rather than train speed. For example, if the standard engine has a piston speed at 10 miles an hour of 265 ft. per minute, the power units of other engines should be taken from the traction calculated at 265 ft. piston speed rather than 10 miles train speed; it is thought more accurate results will be given.

Another error, which results in schedule speeds impossible to attain for the heavy lines, arises from the false assumption that heavily loaded trains on steep grades can be started from a stop and attain a speed of 10 miles an hour in a distance of 2,000 ft. As a matter of actual practice, it often happens that a speed of 10 miles an hour cannot be reached at all on the heavy grade lines. In assuming train-lengths, it would also be more nearly correct to first determine the maximum train-length for each division from actual practice, than to assume some particular train-length for both hill and valley sections. These minor errors in the original computations are gradually being worked out in the practical operation of the system, and those who have had the matter in charge consider the results as satisfactory.

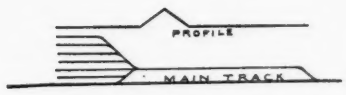


Fig. 1.

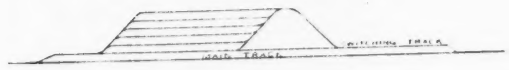


Fig. 2.

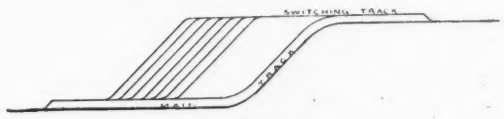


Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

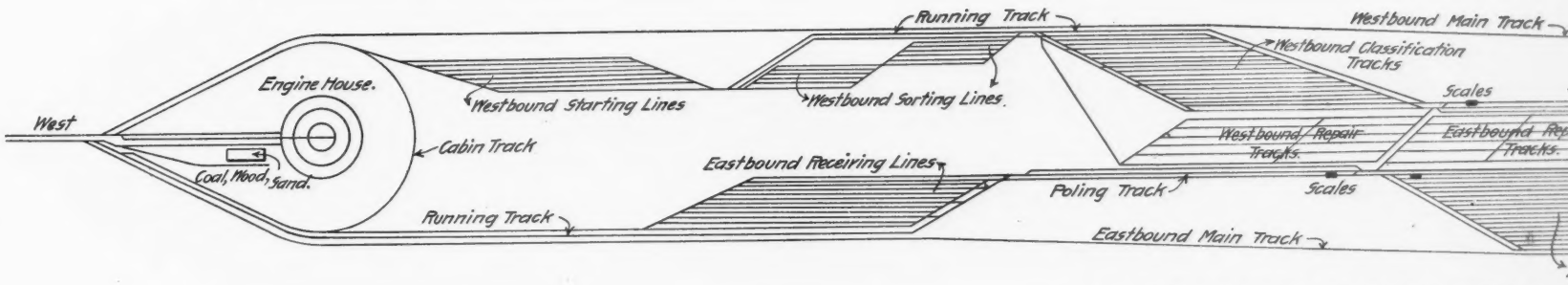
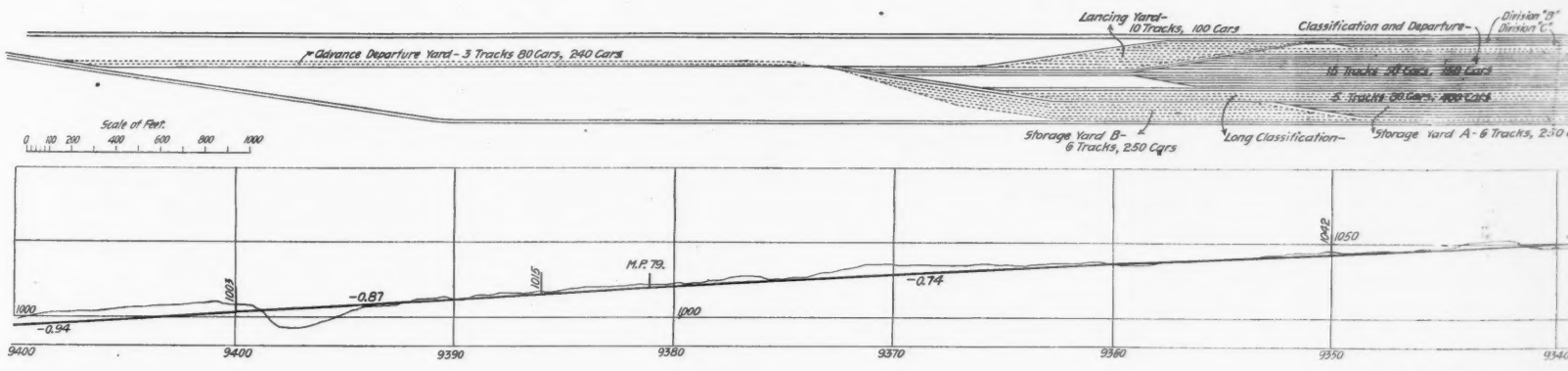
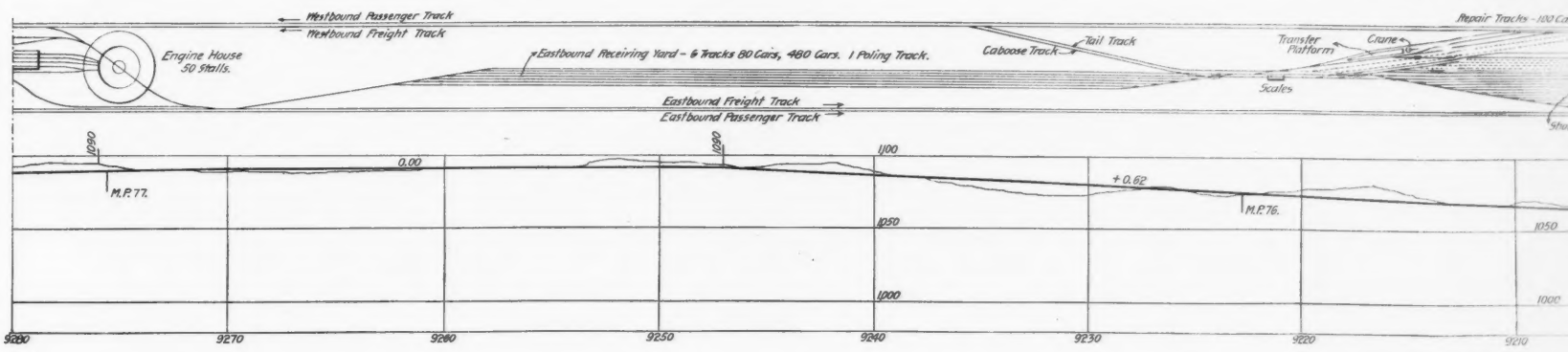


Fig. 8.—Plan Showing General Principles of Yard Cons

Accompanying Report of Committee on Trans



West Bound Yard.



East Bound Yard.

Fig. 9.—Plan for Yard to Make Use of Gravity i

Statement of Capacity of Tracks.

	—Present.—			—Ultimate.—		
West bound—	No. tks.	No. cars.	Total cars.	No. tks.	No. cars.	Total cars.
Receiving	6	80	480	6	80	480
Short class'n and departure	13	50	650	15	50	750
Long classification	2	80	160	5	80	400
Lancing	..	..	..	10	10	100
Repair	4	12	48	..	..	100
Advance departure	..	..	..	4	80	320
Storage	5	50	250	..	..	500
Totals			1,588			2,650

PLANS TO ILLUSTRATE THE PRINCIPLES OF PROCEDURE

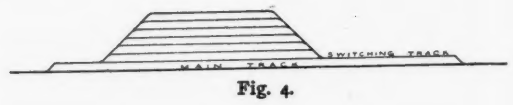


Fig. 4.

Fig. 5.

Fig. 6.

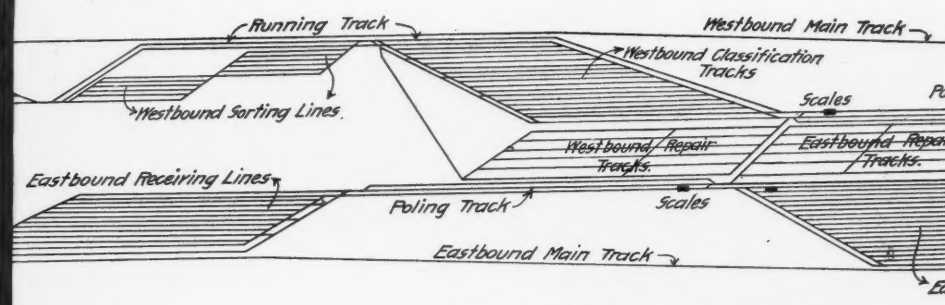
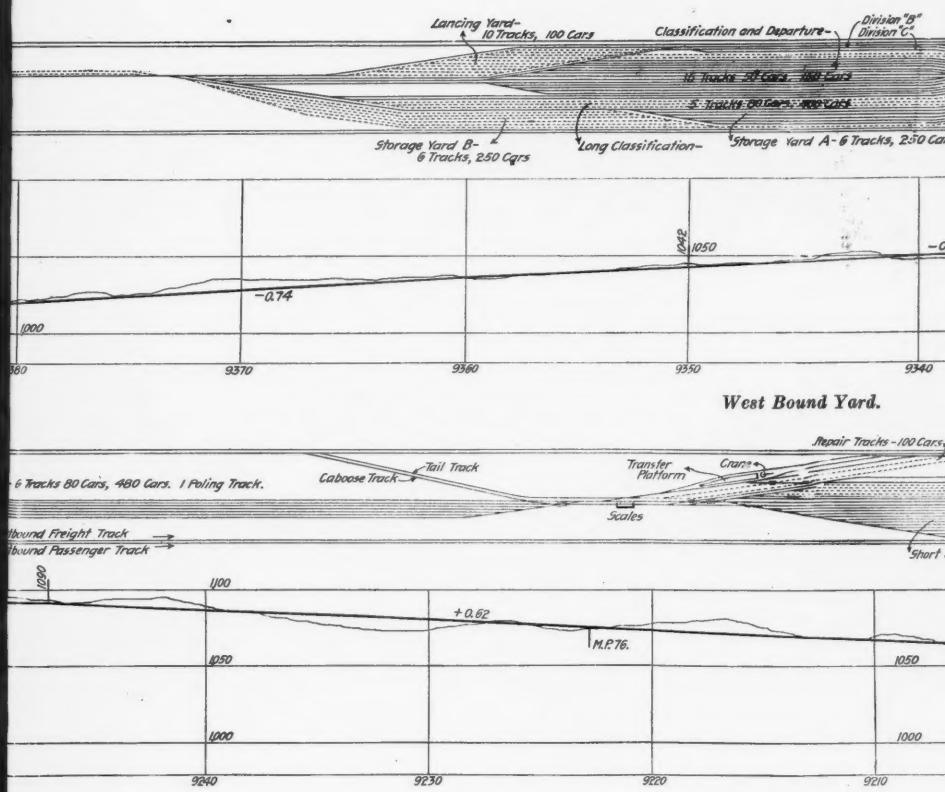


Fig. 8.—Plan Showing General Principles of Yard Constr

Accompanying Report of Committee on Transp



West Bound Yard.

East Bound Yard.

Fig. 9.—Plan for Yard to Make Use of Gravity in

PLANS TO ILLUSTRATE THE PRINCIPLES OF PROCEDURE I

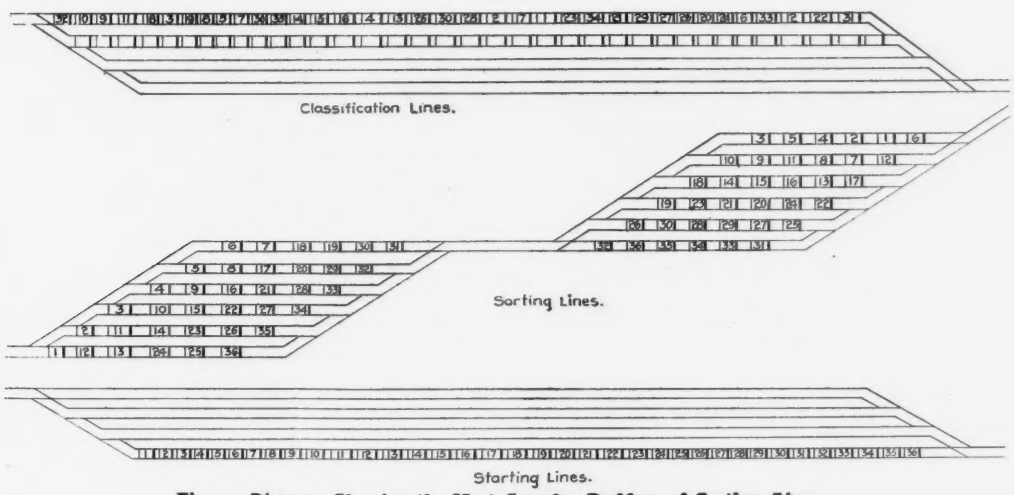
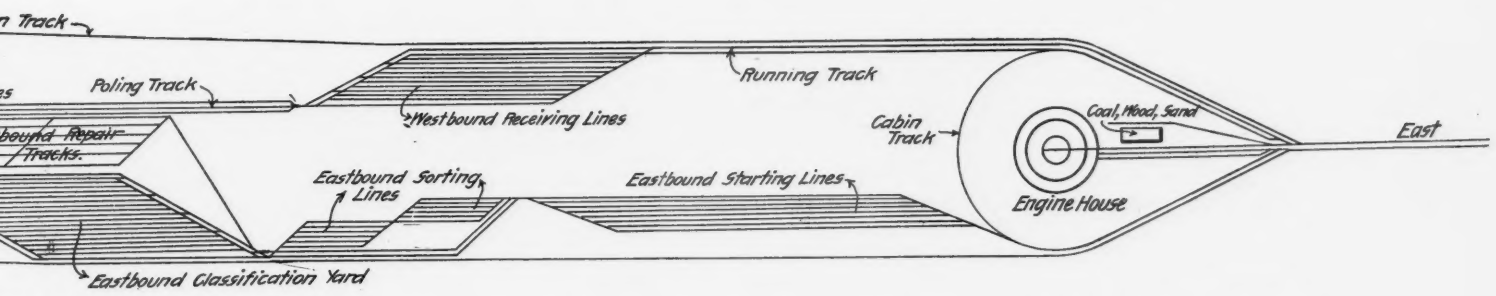
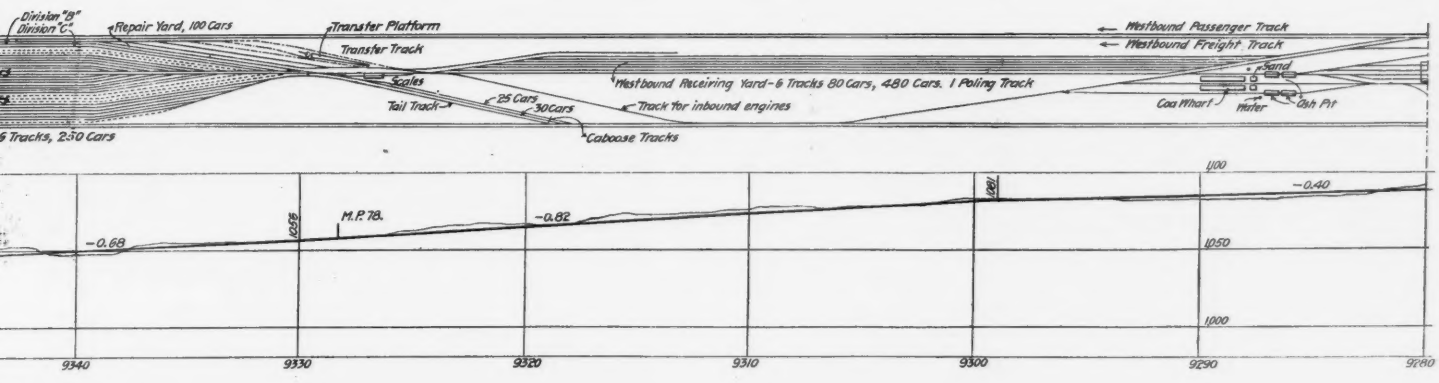


Fig. 7.—Diagram Showing the Most Complex Problem of Sorting Lines.

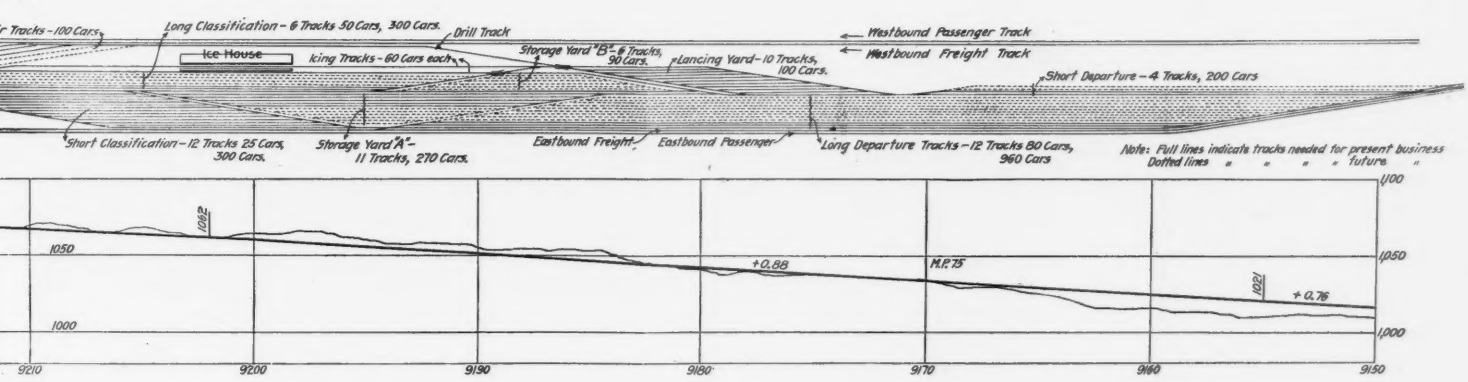


Yard Construction at Divisional Points.

on Transportation Difficulties.



Yard.



ard.

Gravity in Both Directions.

CEDURE IN DESIGNING FREIGHT YARDS.

Statement of Capacity of Tracks.

	Present.			Ultimate.		
East bound—	No. tks.	No. cars.	Total cars.	No. tks.	No. cars.	Total cars.
Receiving	6	80	480	6	80	480
Short classification	12	25	300	12	25	300
Long class'n and starting	2	50	100	6	50	300
Lancing	10	10	100	10	10	100
Departure	3	80	240	12	80	960
Departure	2	50	100	4	50	200
Repair	4	12	48	..	..	100
Storage	5	..	200	..	..	500
Icing	2	50	100	2	50	100
Totals			1,668			3,040

November Accidents.

Our record of train accidents in November, given in this number, includes 115 collisions, 136 derailments and 2 other accidents, a total of 253 accidents, in which 56 persons were killed and 223 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

Collisions.	Rear.	Butting.	Crossing and other.	Total.
Trains breaking in two	12	..	..	12
Misplaced switch	3	1	4	8
Failure to give or observe signal.	6	5	2	13
Mistake in giving or understanding orders	..	5	1	6
Miscellaneous	7	7	9	23
Unexplained	14	19	20	53
Total	42	37	36	115

Derailments.

Broken rail	5	Misplaced switch	9
Loose or spread rail	2	Derailing switch	1
Defective bridge	2	Bad switching	4
Soft roadbed	8	Too quick application of air-brakes	1
Broken wheel	9	Runaway	3
Broken axle	5	Unfastened switch	1
Broken truck	2	Animals on track	4
Fallen brake-beam	1	Landslide	2
Brake hose burst	2	Washout	4
Failure of drawbar	3	Malicious obstruction	5
Failure of drawbar and automatic application of air-brakes	1	Accidental obstruction	5
Loose wheel	1	Unexplained	55
Broken car	1		136

Other Accidents.

Accidental obstructions	2
Total number of accidents	253

A general classification shows:

	Collisions.	Derailments.	Other acc'dts.	Total	Injur.
Defects of road	0	17	0	17	6
Defects of equipment	12	25	0	37	14
Negligence in operating	50	19	0	69	28
Unforeseen obstructions	0	20	2	22	9
Unexplained	53	55	0	108	43
Total	115	136	2	253	100

The casualties may be divided as follows:

	Collisions.	Derailments.	Other accidents.	Total.
Killed—				
Employees	32	14	0	46
Passengers	4	0	0	4
Others	1	5	0	6
Total	37	19	0	56
Injured—				
Employees	94	53	1	148
Passengers	43	20	1	64
Others	6	5	0	11
Total	143	78	2	223

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp.
Defects of road	0	1	0	8
Defects of equipment	0	3	0	2
Negligence in operating	4	47	34	108
Unforeseen obstructions and maliciousness	0	3	4	14
Unexplained	0	10	8	16
Total	4	64	46	148

Thirty-eight accidents caused the death of one or more persons each, and 61 caused injury but not death, leaving 154 (60 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with November of the previous five years shows:

	1900.	1899.	1898.	1897.	1896.	1895.
Collisions	115	122	112	92	49	80
Derailments	136	137	119	111	54	62
Other accidents	2	7	8	8	4	4
Total accidents	253	266	239	211	107	146
Employees killed	46	43	36	23	10	38
Others killed	10	13	4	8	4	8
Employees injured	148	118	121	85	41	87
Others injured	75	86	48	106	14	82
Average per day:						
Accidents	8.43	8.87	7.97	7.03	3.57	4.87
Killed	1.87	1.87	1.33	1.03	0.47	1.53
Injured	7.43	6.80	5.63	6.37	1.83	5.63
Average per accident:						
Killed	0.22	0.21	0.17	0.15	0.13	0.32
Injured	0.88	0.77	0.71	0.91	0.51	1.16

The record of fatalities in November is not unusually large though there were half a dozen bad passenger train accidents. In one derailment, that at Bailey's, Pa., on the 9th, at 3 o'clock in the morning, it is said that the train was moving at the rate of 65 miles an hour; but, thanks to the vestibules and the strong construction of the cars now used on these fast trains, all the passengers got out alive. The collision near Missouri Valley, Iowa, on the 10th, is reported as due to mistakes in telegraphic orders, as were four less serious collisions. The passenger train disaster at Beaver, Pa., on the 28th, at 1 o'clock in the morning, was very fortunate, as far as the passengers were concerned, but the tragedy of the express car was a striking illustration of the vicissitudes of travel. The upper part of the car floated many miles down the swollen Ohio River, and the accounts stated that the messenger's body could not be found.

At Hargrove, Ala., on the 17th, there was a butting collision, resulting in three deaths, which was due to a quite unusual cause; the engineman thought that he received an all-right signal from the conductor, when, in fact, the conductor was inside the telegraph office. We say unusual cause; but, in fact, it is strange that such mistakes do not occur oftener, for hundreds of start signals are given by conductors to enginemen every night in such a way that the engineman trusts partly to guess. It is very unlikely in any given case that any person will give an unauthorized go-ahead signal, and it is quite probable that if such a signal should be given there would be no difficulty in stopping the train before the engineman could run away with it, so irregular practices continue. And the number of conductors who employ for the all-right or go-ahead signal some motion or sound different from that prescribed by the code is legion.

Near Jimulco, Mex., on the 29th, there was a collision between a freight train and a work train in which it is said 20 persons were killed.

There were 17 electric car accidents in the United States in November, including one case in which a car ran into an open drawbridge, though it did not fall into the water; and one case in the city of Chicago where the interior of a car was wrecked by highwaymen who "held up" the car and robbed and maltreated the passengers. In these 17 accidents three persons were killed and 45 injured.

European sleeping cars are better than ours, if we may trust the judgment of a "reliable gentleman" from Boston, whose opinion has lately been quoted. He has just returned from a summer spent in Europe, principally in the Austrian Tyrol, and says:

"I think the Europeans are ahead of us in their sleeping cars. They are all compartments, the compartments accommodating from two persons upward. There is one drawback. If you are traveling alone you are likely to have to share a compartment with a stranger. There is no way to avoid this unless you are rich, for they will not sell you the extra berth in the compartment unless you buy an extra railroad ticket also. But even if one has to bunk in with a stranger, I prefer the European sleeper. It is only one man there that you have to foregather with, but here there is a whole car full of passengers, of both sexes, practically sleeping in the same room. It is only because we are used to them that we do not think how extraordinary our sleepers really are."

We quote the item merely to remark that the American plan survives because it suits the American people. As every one knows, the compartment plan has been extensively tried in this country, North, South, East and West. The railroads and the sleeping car companies have made reasonable efforts to give it a fair opportunity to recommend itself. Indeed, it continues in use on a few lines doing a large traffic, where the number of persons traveling in parties of two (one of whom is willing to take an upper berth), is large enough to warrant running one such car on a train. And why do Americans, not all of them devoid of taste and refinement, continue to prefer to bunk in with a dozen strangers rather than with a single one? Simply because that is the lesser evil. For the same reason that in a day car, after dark, one feels more at ease with a considerable number of fellow passengers than with a single one. In short, if a gentleman—or lady—must for a brief time disregard some of the customs of refined society, he or she prefers to have a crowd present for greater privacy.

The passenger traffic of the Russian railroads, which expanded greatly on the first introduction of the reduced rates, in 1894, which, for long distances, are very low, and in 1896 was more than twice as great as in 1888, grew at the moderate rate of 5½ per cent. from 1896 to 1897. In the latter year the average length of journey was 77 miles, which is hardly to be equaled in any other country. The average receipt per passenger per mile was 0.618 cent, which is probably the lowest in the world. The number of non-paying passengers was one-eighth of those who paid. More than half of these were soldiers, and no less than 440,227 were prisoners. There are four classes in Russia, but the fourth-class has a very limited application, chiefly to large bodies of laborers going for work (flocks go from the north to the southern wheat fields and follow up the harvest northward), and to emigrants. They are less than 6 per cent. of the whole number of passengers, while 82 per cent. travel third-class. The reformed passenger tariff made no reductions for distances less than 125 miles, and it is long-distance travel, therefore, which was stimulated by it.

NEW PUBLICATIONS.

The Practical Engineer Pocketbook, 1901.—The Technical Publishing Co., Ltd., 31 Whitworth street, Manchester, England, sends the twelfth annual edition of its Pocketbook, which is published at 1s 6d net. It is a useful and well arranged pocketbook, especially for mechanical engineers. The same concern sends a copy of the second edition of the Electrical Pocketbook, published at 1s, which, as its title indicates, is especially designed for electrical engineers. Both of these pocketbooks have excellent indexes.

Street Cars.—The J. G. Brill Co., Philadelphia, issues a pamphlet describing the Brill convertible car, which received the grand prize at Paris. Various designs of this car are shown by engravings and photographs, with suitable description. Certain of the details of construction are also shown.

TRADE CATALOGUES.

Coal Handling for Steam Generation.—The C. W. Hunt Co., 45 Broadway, New York, sends us a pamphlet describing the Hunt noiseless conveyor and other machinery for handling coal, ashes and similar materials in power stations. It is a pamphlet of 40 pages, with many illustrations showing most ingenious arrangements.

The Cleveland Twist Drill Co., Cleveland, Ohio, has published a pamphlet entitled "Eleven Little Pictures." It is simply a collection of views in and about the works of that company. The pictures are interesting and are very well reproduced. Some of these of an unusual character are "the dining room in action," being the lunch room for employees; "the kitchen," a scene in the circulating library, and another in the reading room and the mechanical drawing class in the night school.

Concrete-Steel Arch Bridges.—The Aberthaw Construction Co., 7 Exchange Place, Boston, issues a pamphlet of 40 pages designed to advertise the Ransome system of concrete-steel construction. Numerous attractive pictures of their concrete-steel arches, with and without stone masonry facing, are shown.

Train Accidents in the United States in November.

COLLISIONS.

Rear.

1st, on Southern Railway, near Swannanoa, N. C., a freight train broke in two and the rear portion afterward ran into the forward one, doing slight damage. The engineman was injured.

1st, on Northern Pacific, near Hinckley, Minn., a passenger train ran over a misplaced switch and into the rear of a freight train standing on the sidetrack, making a bad wreck. The caboose and one car took fire and were burned up. A brakeman in the caboose was burned to death.

1st, on Delaware, Lackawanna & Western, near Summit, N. J., five cars broke away from the rear of a freight train and ran back some distance down grade into the head of a passenger train. Engineman Henry Dalrymple, of the passenger train, saw the runaway cars soon enough to stop and set back; and he succeeded in so adjusting his speed to that of the freight cars that the damage to the engine and the caboose was slight.

5th, 6 p. m., on Pennsylvania road, at Radnor, Pa., a freight train ran into the rear of a preceding freight, derailing 14 cars, which took fire and were burned up. All four main tracks were blocked about four hours. Two trainmen were injured. The trainmen say that the block signal at the entrance of the block indicated all clear, but the signalman says that he gave a permissive signal.

6th, 11 p. m., on New York Central & Hudson River, near Wende, N. Y., a freight train broke in two and the rear portion afterward ran into the forward one, wrecking several cars, which blocked all four main tracks. Westbound passenger train No. 15 ran into the wreck, damaging the engine and most of the cars.

7th, on Missouri Pacific, near Wichita, Kan., a mixed train broke in two and the rear portion afterward ran into the forward one, wrecking one freight car. Two passengers were injured.

9th, on Delaware & Hudson, near Meadowdale, N. Y., an inspection engine ran into the rear of a preceding passenger train; the fireman was injured.

11th, on Missouri Pacific, at Leavenworth, Kan., a passenger train ran over a misplaced switch and into a switching engine standing on the side track; seven passengers were injured.

11th, on Missouri Pacific, at Sugar City, Col., an eastbound passenger train ran over a misplaced switch and into the rear of a freight train standing on a sidetrack. The engine and caboose were wrecked and the combustible portion of the wreck took fire and was burned up. Four trainmen were injured.

12th, on Great Northern, at Winchester, Wash., a freight train ran into the rear of a preceding freight, wrecking eight cars. One employee was fatally injured.

16th, 6 p. m., on Cumberland Valley road, at Dillsburg Junction, Pa., a passenger train ran into the rear of a preceding freight, wrecking the caboose and three freight cars and overturning the engine. The engineman and fireman were killed.

17th, on Alabama & Vicksburg, near Jackson, Miss., a passenger train ran into the rear of a preceding freight which had stopped to take coal, and the caboose and several freight cars were wrecked. Two men in charge of horses were killed and three other men and one trainmen were injured.

17th, on Lehigh Valley, near Pittston, Pa., a freight train ran into the rear of a preceding freight, and the engine and two cars fell down a bank. A fire was started by explosives in one of the cars, and the cars were burned up. The second train ran past a distant and home signal set against it; "the air-brakes failed to hold."

19th, 4 a. m., on Michigan Central, near Eden, Mich., a freight train which had become stalled on a grade was run into at the rear by a following freight, and the engine and several cars were wrecked; fireman injured.

19th, on Northwestern Elevated, at Chicago avenue, Chicago, Ill., a passenger train standing at the station was run into at the rear by a following passenger train, and two cars were damaged. Three passengers were injured.

20th, on Denver & Rio Grande, near Belden, Colo., a freight train broke in two and the rear portion afterward ran into the forward one, derailing two cars. One tramp was killed and another injured.

23rd, on Central of New Jersey, near Netherwood, N. J., rear collision of freight trains; one trainman injured.

25th, on Hannibal & St. Joseph, at Mason, Mo., a freight train which had been unexpectedly stopped was run into at the rear by a following freight, and the caboose was wrecked. A man riding on the cowcatcher of the second train was killed.

26th, on Pennsylvania road, at Morrisville, Pa., rear collision of freight trains, wrecking the caboose. A brakeman was killed and another injured.

26th, on Western & Atlantic, at Bartow, Ga., a freight train, drawn by two engines, ran into the rear of a preceding freight, badly damaging both engines and eight cars. Three trainmen were injured.

28th, on Missouri, Kansas & Texas, near Letott's, Tex., the caboose of a freight train broke away and afterward ran into the forward part of the train; conductor and one passenger injured.

30th, 6 a. m., on Chicago & Northwestern, at Jefferson Junction, Wis., a freight train ran into the rear of a preceding freight, derailing the engine and four cars. The caboose took fire from the stove and, with three cars, was burned up.

And 20 others on 18 roads, involving 2 passenger and 31 freight and other trains.

Butting.

2nd, on Florence & Cripple Creek, near Elkton, Colo., butting collision between a freight train and a locomotive, badly damaging both engines. Three trainmen were injured.

7th, on Baltimore & Ohio, at Bellville, Ohio, butting collision of freight trains, the eastbound train having run

past a station at which it was ordered to wait for the westbound. A brakeman was killed.

8th, on Southern Pacific, near Roseburg, Ore., butting collision of freight trains, making a very bad wreck. One engineman and one fireman were killed and three other trainmen were injured, two of them fatally. There was a dense fog at the time.

9th, 2 a. m., on Southern Railway, near Hodges, Tenn., butting collision between a passenger train and a double header freight. One engineman was killed and four other trainmen were injured. All three engines were wrecked. It is said that the men on the freight, while standing on a sidetrack at Hodges, mistook an empty engine, which was running as the first section of the passenger train, for the passenger train itself.

10th, on Chicago & Northwestern, near Missouri Valley, Iowa, passenger train No. 2 collided with a freight train, badly damaging the engine and several cars. Two passengers were fatally injured; the engineman and several trainmen were also hurt. It is said that a mistake in telegraphic orders was the cause of the collision.

12th, 1 a. m., on Missouri, Kansas & Texas, near Sherman, Tex., butting collision between a passenger train and a freight, badly damaging both engines. One fireman was killed and both enginemen were injured. One passenger and three other trainmen were also hurt.

13th, on Lake Shore & Michigan Southern, near Kalamazoo, Mich., butting collision between a passenger train and a freight; seven passengers and three trainmen injured.

14th, on Pennsylvania road, at Clarendon, Pa., butting collision of freight trains, making a bad wreck, which took fire and was partly burned up.

16th, 8 p. m., on Lake Shore & Michigan Southern, near Polk, Pa., butting collision between passenger train No. 226, and a freight train of the Pennsylvania road, wrecking both engine and several cars of both trains. Three trainmen were killed and three trainmen and six passengers were injured.

17th, 5 a. m., on Chicago, Milwaukee & St. Paul, at Beloit, Wis., a passenger train standing at the station was run into in front by a freight train which approached at uncontrollable speed; two trainmen and one passenger injured. The track approaching the station was covered with sleet and it is said that the air-brake pump failed.

17th, 6 a. m., on Savannah, Florida & Western, near Thomasville, Ga., butting collision of freight trains, making a bad wreck. A fireman was killed and one engineman was fatally injured.

17th, on Baltimore & Ohio, near Ohio Pyle, Pa., butting collision of freight trains, wrecking both engines and four cars. One engineman was killed and a brakeman injured. It is said that one of the trains disregarded a meeting order.

17th, 10 p. m., on Southern Railway, near Hargrove, Ala., butting collision of freight trains, both carrying passengers, wrecking both engines and many cars. One engineman, one fireman and one brakeman were killed and five trainmen and three passengers were injured. It is said that the northbound train had been started from Ardela while the conductor was in the telegraph office receiving orders, the engineman having started on a false signal. The conductor took a locomotive and tried to overtake his train, but was not in season to prevent the collision.

19th, 1 a. m., on Pennsylvania road, at Pittsburgh, Pa., butting collision of freight trains; one trainman injured.

20th, on Savannah, Florida & Western, near Burroughs, Ga., butting collision of freight trains, making a bad wreck, which took fire and was burned up. One trainman was killed and four were injured. There was a dense fog at the time.

20th, on Great Northern, at Lyons, Wash., a freight train, to which was attached a passenger car, ran over a misplaced switch and into the head of a freight train standing on the sidetrack, badly damaging both engines. The passenger car caught fire and was burned up.

21st, on Cincinnati & Muskingum Valley, near Ellis, Ohio, butting collision between passenger train No. 34 and a Cleveland, Akron & Columbus mixed train. One engineman was killed and three other trainmen were injured.

22nd, 4 a. m., on New Orleans & Northeastern, at Sandersville, Miss., butting collision between a southbound passenger and a northbound freight train, wrecking both engines and three freight cars. Four trainmen, three passengers and three tramps were injured. It is said that an operator failed to deliver an order to the freight.

26th, on Southern Pacific, near Dunsmuir, Cal., butting collision between a passenger train, drawn by two engines, and a freight train, badly damaging three locomotives and several cars. Two trainmen were injured.

26th, 9 p. m., on New York Central & Hudson River, near Syracuse, N. Y., butting collision between a passenger train and a freight, injuring two trainmen. The freight was backing into a siding at the time.

27th, on Chicago, Burlington & Quincy, at Thayer, Iowa, butting collision of freight trains, wrecking both engines and several cars. Two trainmen were injured. It is said that the collision was due to the failure of one of the trains to flag the other.

27th, on Southern Railway, at Knoxville, Tenn., butting collision between a freight train and an empty engine, badly damaging both engines. There was a dense fog at the time and a switching freight train on another track subsequently ran into the wreck, derailing several cars. One trainman was injured.

29th, on Chicago, Burlington & Quincy, at Harlem, Mo., butting collision of passenger trains; two employees injured.

And 14 others on 12 roads, involving 2 passenger and 26 freight and other trains.

Crossing and Miscellaneous.

4th, on Plant System, at Port Tampa, Fla., collision between a passenger train and switching engine; one trainman injured.

7th, on Fort Worth & New Orleans, at Waxahachie, Tex., collision between a passenger train and a switching engine; two trainmen injured.

10th, on Lehigh Valley, at Milltown, N. Y., collision of freight trains; three trainmen injured.

17th, 9 p. m., at Selma, Ala., a freight train of the Southern Railway collided with a work train of the Birmingham, Selma & New Orleans; two trainmen injured.

18th, 5 a. m., on Galveston, Houston & Henderson, at Galveston, Tex., collision between a newspaper train and a switching engine; one fireman was killed and one engineman fatally injured.

18th, on Wheeling & Lake Erie, at Zanesville, Ohio, a passenger train ran over a misplaced switch and across a turntable and collided with a locomotive. The engineman jumped off and was killed and three trainmen and one passenger were injured.

18th, on Lake Shore & Michigan Southern, at White Pigeon, Mich., two engines of a freight train, having taken water and being on the way back to their train, coupled together, collided with the front car; the engineman and fireman of the rear engine were killed.

20th, on Louisville & Nashville, at Jones, Tenn., a freight train collided with three freight cars which had been blown out of a siding, and the engine was badly damaged. The engineman was injured.

20th, on Texas & Pacific, at Longview Junction, Tex., a passenger train ran over a misplaced switch and into a locomotive standing on the sidetrack. Two trainmen were injured.

21st, 7 p. m., on New York Central & Hudson River, near Ravena, N. Y., collision between a passenger train and a switching engine; two trainmen injured.

22nd, on Pennsylvania road, at Carrolltown, Pa., seven cars of a freight train became uncontrollable and ran down grade some distance and collided with some standing freight cars. In one of these cars were a number of laborers eating dinner; the wreck took fire and three of the laborers were injured, one of them fatally.

23rd, 10 p. m., on Wabash road, at East Decatur, Ill., collision between a passenger train and an empty engine; three trainmen injured. The passenger train was six hours late and it is said the men on the empty engine had forgotten that it was due.

24th, 4 a. m., on Plant System, at Green Pond, S. C., collision between a passenger train and a freight; one engineman killed and one fireman injured.

24th, 9 p. m., on New York Central & Hudson River, at Depew, N. Y., collision of freight trains; one conductor killed. The caboose of one of the trains took fire and was burned up. The conductor was injured by the collision and was subsequently burned to death.

25th, 5 a. m., on Boston & Maine, at Salem, Mass., a passenger train ran over a misplaced switch and into the side of a freight train standing on the adjoining track. The fireman and one trainman were injured.

26th, at Peru, Ind., a passenger train of the Wabash road ran into a freight of the Lake Erie & Western at the crossing of the two roads, wrecking a freight car.

27th, on Chicago, Milwaukee & St. Paul, at Madison, Wis., collision between a freight train and a switching engine; two trainmen injured.

29th, 11 p. m., on Houston, East & West Texas, at Penaha, Tex., collisions of cars in a freight train which was switching; two tramps injured.

And 18 others on 16 roads, involving 8 passenger and 27 freight and other trains.

DERAILMENTS.

Defects of Roadway.

16th, on Illinois Central, near Dyersburg, Tenn., a freight train broke through a trestle bridge which had been weakened by fire, and the engine and seven cars were wrecked. Three trainmen were injured.

18th, on Spokane Falls & Northern, near Dragoon, Wash., a freight train was derailed by a loose rail; one tramp killed and two injured.

18th, on Kansas City Southern, near Hudson, Ark., a freight train broke through a trestle bridge and the tender and seven cars were wrecked.

21st, on Missouri, Kansas & Texas, at Blue Jacket, Ind. T., passenger train No. 2, running at full speed, was derailed by a broken rail, all of the cars being ditched. The mail car caught fire and, with its contents, was burned up.

25th, on Southern Pacific, near Antioch, Cal., the three rear cars of a passenger train were derailed by a short rail which appears to have been displaced by the passage of the forward part of the train. The three cars were overturned. One passenger and two cooks in the dining car were injured.

26th, 8 p. m., on the Atchison, Topeka & Santa Fe, near Agency, Kan., a freight train was derailed by a broken rail, and the engine and four cars fell down a bank; three trainmen injured.

And 11 others on 5 roads, involving 1 passenger train and 10 freight and other trains.

Defects of Equipment.

1st, 3 a. m., on Pennsylvania road, near Springbrook, N. Y., a freight train was derailed by a drawbar which was pulled out and fell upon the track, and 10 cars of oil and several cars of coal were wrecked. Of the ten oil tank cars nine were torn open and emptied.

4th, 4 a. m., on Southern Pacific, at Keswick, Cal., a freight train was derailed by a broken axle, and several cars were wrecked. Two tramps were killed and two injured, one of them fatally.

5th, 1 a. m., on Louisville & Nashville, at South Park, Ky., a freight train was derailed by a broken truck, and 16 loaded cars were wrecked. Two trainmen were injured.

9th, 6 p. m., on Pennsylvania road, at Glen Loch, Pa., a passenger train running at high speed was derailed by the breaking of the flange of one of the wheels of the locomotive, and the engine ran into the side of a freight train on an adjoining track. The injuries to the passengers were all slight.

18th, 5 a. m., on Missouri, Kansas & Texas, near Dallas, Tex., a freight train was derailed by a broken wheel flange, and eight loaded cars fell down a bank. A tramp was killed and another injured.

And 20 others on 15 roads, involving 20 freight trains.

Negligence in Operating.

3rd, 5 a. m., on Bradford, Bordel & Kinzua, near Bradford, Pa., a train consisting of a locomotive and one officers' car became uncontrollable on a steep grade and was derailed. The car took fire from the oil in the lamps and was burned up. Three trainmen were injured, one of them fatally.

13th, on North Pacific Coast road, near Fairfax, Cal., a freight train was derailed at a misplaced switch and eight cars were wrecked. One brakeman was injured.

14th, on Birmingham Mineral road, at Reeders, Ala., a passenger train was derailed at a misplaced switch, and the engine was badly damaged. Several passengers were injured.

16th, on New York, New Haven & Hartford, at Rockland, Mass., a passenger train was derailed at a misplaced switch and ran against and damaged a dwelling house. Two trainmen were injured.

20th, on Denver & Rio Grande, near Gray's, Colo., a freight train became uncontrollable on a descending grade and the engine and 12 cars were derailed and wrecked. A brakeman was killed and four other trainmen were injured.

23rd, on Missouri, Kansas & Texas, near Galveston, Tex., the engine of a passenger train was derailed at a misplaced switch and was ditched. After the engine passed the switch it was in some way turned so that the cars were not derailed. Two employees were injured.

25th, 5:45 a. m., on Pittsburgh, Fort Wayne & Chicago, near Lima, Ohio, a westbound freight was derailed at the derailing switch approaching the crossing of the D., L. & N., and the engine and three cars were ditched. The engineman was injured. It is said that the signalman turned the signal against the train when it was quite near the crossing. A freight train was approaching the crossing from the west and, the engineman having not observed the wreck, on account of a D., L. & N. train on the crossing, ran into the wreck (which fouled his own track) and the engine and 15 cars of this train were derailed.

27th, on Houston & Texas Central, near Ferris, Tex., a passenger train was derailed at an unfastened switch; one passenger and two trainmen were injured.

And 11 others on 11 roads, involving 1 passenger train and 10 freight and other trains.

Unforeseen Obstructions.

6th, on Chicago & Northwestern, near Iron Mountain, Mich., a freight train was derailed by an accidental obstruction, and the engine was ditched. The engineman was injured.

10th, on Atlantic Coast Line, near Hope Mills, N. C., passenger train No. 78 was derailed by a malicious obstruction, and the engineman was fatally injured.

10th, on Pittsburgh, Cincinnati, Chicago & St. Louis, near Marion, Ind., a freight train became uncontrollable on a descending grade in consequence, it is said, of the air-brakes having been cut off between the engine and the train by tramps, and five cars, including a carload of cattle, were derailed.

12th, on Atlantic Coast Line, near Fayetteville, N. C., a passenger train was derailed by a malicious obstruction, and the engine and first two cars were overturned. Three trainmen and one passenger were injured.

14th, on Lexington & Eastern, at Torrent, Ky., the locomotive of a work train was derailed in a tunnel by earth which fell upon it from the roof.

20th, on Louisville & Nashville, at West Harpeth, Tenn., a passenger train was derailed by a telegraph pole which had been blown down across the track.

21st, 8 p. m., on Baltimore & Ohio, near Cumberland, Md., eastbound passenger train No. 46 was derailed by the roof of a freight car which had been blown off and lodged on the track. The engine was overturned and the first car was ditched. Four trainmen were injured.

26th, on Lehigh Valley road, near Moravia, N. Y., a passenger train was derailed at a washout and one passenger was injured.

27th, on Pittsburgh, Fort Wayne & Chicago, at Economy, Pa., a freight train was derailed at a point where the track had been weakened by a flood, and two cars fell into the Ohio River.

28th, on Pittsburgh & Lake Erie, near Pittsburgh, Pa., a work train was derailed at a point where the track had been weakened by a flood, and several cars fell into the river. Two employees were fatally injured.

30th, 8 p. m., on Yazoo & Mississippi Valley, near Pocahontas, Miss., a passenger train was derailed by running over a steer; the baggageman was injured.

28th, 1 a. m., on Pittsburgh, Fort Wayne & Chicago, at Beaver, Pa., westbound passenger train No. 301 was derailed at a point where the roadbed had been weakened by a washout, and the engine and the mail, baggage and express cars fell into the Ohio River. The express messenger was drowned in his car and the engineman and three other trainmen were injured. The passengers all escaped with slight injuries.

And 8 others on 7 roads, involving 2 passenger and 6 freight and other trains.

Unexplained.

4th, on Alabama Great Southern, at Caldwell's, Ala., a freight train was derailed and one man was injured.

4th, on Union Railroad, at Duquesne, Pa., a freight train was derailed and the engine pulling it was overturned. The engineman was killed and the fireman injured. A pushing engine at the rear of the train was kept pushing for some time after the derailment occurred at the front end.

7th, on Great Northern, near Pipestone, Minn., a passenger train was derailed and two passenger and one baggage car were ditched. Three passengers were injured.

8th, on Philadelphia & Reading, at Philadelphia, Pa., a car in a freight train was derailed and ran against a wagon passing in the street near by. A man on the wagon was injured.

9th, 3 a. m., on Pennsylvania road, at Bailey's, Pa., a passenger train was derailed while running at high speed and the cars were thrown diagonally across the track in various positions; but none of them were very badly broken up and only six passengers were injured. The tender is said to have been the first vehicle to leave the track.

9th, on Southern Pacific, near St. Martinsville, La., a passenger train was derailed and the engine was overturned. The engineman was killed and the fireman injured.

13th, on Potomac, Fredericksburg & Piedmont, near Reynolds, Va., a mixed train was derailed, and the passenger car and one freight car were overturned. A brakeman was injured.

14th, on Kansas City, Memphis & Birmingham, near Horse Creek, Ala., a freight train was derailed and the engine was overturned in the ditch. Three cars were wrecked. The engineman was killed and the fireman fatally injured.

14th, on Southern Railway, at Burlington, N. C., passenger train No. 15 was derailed, and one passenger and one trainman were injured.

17th, on Calvert, Waco & Brazos Valley road, near Marlin, Tex., a work train was derailed and two employees were injured.

20th, on Pennsylvania road, at Philadelphia, Pa., several cars of a freight train, being switched, were derailed and ran against another freight moving on an adjoining track. One conductor was killed and three other trainmen were injured.

21st, on Erie road, at Passaic, N. J., the locomotive of a freight train was derailed and one brakeman was injured.

22nd, on Chesapeake & Ohio, near Richmond, Va., a freight train was derailed and several of the cars ran against a water tank, knocking it down and spilling 20,000 gals. of water.

22nd, on New Orleans & Northeastern, near Orvisburg, Miss., a freight train was derailed on a bridge and 13 loaded cars fell to the ravine 40 ft. below.

24th, on Choctaw, Oklahoma & Gulf, near Memphis, Tenn., a locomotive was derailed and the engineman was injured.

24th, 8 p. m., on Pittsburgh, Cincinnati, Chicago & St. Louis, near Birmingham, Pa., a freight train was derailed and the engine, having remained on the track and broken away from the tender, ran half a mile uncontrolled to the junction of the Pittsburgh, Virginia & Charleston road, where it ran into the front end of a freight train, injuring the engineman of the standing train. The runaway engine crossed a number of crowded streets and ran for eight squares through 21st street.

25th, 4 a. m., on St. Louis & San Francisco, near Osceola, a passenger train was derailed in a cut and the engine was badly damaged. The engineman and fireman were killed.

30th, on Southern Pacific, at Winnemucca, Nev., a doubleheader freight train was derailed and both engines and seven cars were ditched and wrecked. One fireman was killed.

30th, on Baltimore & Ohio, at Wheeling, W. Va., a freight train was derailed; and the engine drawing it, being pushed with considerable force by another engine at the rear of the train, on which steam had not been

shut off, was turned around so that it faced backward. Three employees were injured.

And 36 others on 26 roads, involving 2 passenger and 34 freight and other trains.

OTHER ACCIDENTS.

11th, on Northern Pacific, near Whitehall, Mont., a car in a passenger train was badly damaged by a blast of dynamite in a quarry close to the track. One passenger was injured. It appears that the train was flagged, but that the engineman did not see the flag soon enough to stop.

26th, on Chicago & Northwestern, near State Center, Iowa, the engine of fast mail train No. 15 was badly damaged by a stone hanging from a derrick which had been accidentally left foul on the track. The smokestack and the cab were knocked off and the fireman was injured. There was a dense fog at the time.

A summary will be found on another page.

TECHNICAL.

Manufacturing and Business.

Richard S. Mercer, who has been connected for some time with the Thornton N. Motley Company, has resigned his position with that company in order to represent Manning, Maxwell & Moore.

Player cast steel truck and body bolsters, made by the Shickle, Harrison & Howard Iron Company, St. Louis, are specified for the 2,500 box cars ordered by the Missouri Pacific from the American Car & Foundry Company.

The B. F. Sturtevant Company is in receipt of a letter from the Enterprise Foundry Company of Sackville, N. B., which contained this story of the endurance of a blower: "We have had one of your No. 6 noiseless blowers in use for 28 years with entire satisfaction, but the blast wheel is now apparently worn out and the left side piece is broken. If we had this left side piece and the blast wheel, as shown in your circular, it would make the blower all right. This blower is driven by two belts, but we fear we have been driving it at too high a speed."

A. B. Burtis has resigned from the Lowe Brothers Co. to become General Manager of the Mamolith Carbon Paint Company. This company will make carbon and other kinds of paint of all colors for railroads, electric roads, bridges and structural work. It has a large dry color plant at Poplar Bluffs, Mo., with offices and works for grinding in New York and Cincinnati. The company owns and controls extensive mines of high grade carbon. Paints made from these materials have been subjected to a large number of comparative tests, and a number of buildings in various parts of the country have been painted in the past few years, showing its qualities and durability.

Iron and Steel.

The Commercial Club of Terre Haute, Ind., is receiving subscriptions from people of that city toward securing a rolling mill in Terre Haute.

D. H. Bacon, President of the Minnesota Iron Company, has been elected Chairman of the Board of Directors of the Tennessee Coal, Iron & Railroad Company.

The National Tube Company has bought the plant of the Standard Seamless Tube Company, of Ellwood City, Pa., for $500,000. This includes 10 acres of land and a plant with a capacity of 65 tons of finished steel tubes a day.

Judge McPherson, in the United States District Court, Philadelphia, has appointed John N. M. Shimer and Wm. H. Stoake receivers in bankruptcy of the C. I. Baird & Co., controlling a number of iron furnaces, most of which are idle and are for sale or lease. The liabilities are said to amount to $1,500,000.

At a dinner given in Chicago on Dec. 28 by Judge E. H. Gary, President of the Federal Steel Company, informal announcement was made that $1,000,000 would be spent for a structural iron department in connection with the Illinois Steel Works, at South Chicago, and in general repairs and additions to the mills.

The Jungfrau Railroad.

The Jungfrau Railroad, which was in operation up to the Rothstock Station, about 5½ miles, last summer, was not extended after the middle of May, because the carriage of materials would have interfered with the passenger traffic. The tunnel last May had been excavated 1,555 ft. beyond Rothstock, and Oct. 1 last work was resumed on it with a force of 80 or 90 men, for whom provisions and materials for the whole winter are stored at the Eiger Glacier. To reach this next station, "Ice Sea," will require a further extension of the tunnel for 3,390 ft. It is intended to complete it so far by the end of 1901. "Ice Sea" will be 10,336 ft. above sea level, which is higher than any point now reached by rail in Europe.

Railroad Material for South Australia.

Bids are asked by the Supply and Tender Board Office, Adelaide, until Feb. 6 for furnishing 64 mild-steel boiler plates, 69 spiral springs, 278 engine and tender tires, 1,300 carriage tires, 412 carriage axles, 6 steam-pressure gages, 200 india-rubber buffer springs, 24 bars convex iron, 20 double Detroit sight-feed lubricators, etc. Specifications may be seen at the office of the Agent-General for South Australia, Victoria street, London, England.

Big Navy Yard Contract Awarded.

The contract for building the sea wall and extending the water front of the Charlestown Navy Yard has been let to Norcross Bros., of Boston, at about $155,000. The work will be begun immediately, and when finished the area of the navy yard will be increased by 20 acres.

The New Panama Canal.

The annual meeting of the new Panama Canal Company was held in Paris Dec. 27. The director who presided (M. Rouget) said that it is permissible to hope that a reasonable agreement may be made with the American and the Colombian governments, which will finally determine the choice of the United States in favor of the Panama route. It is the opinion of the directors that before thinking of any other plan all efforts should be made to bring about such an agreement, and negotiations are now being pursued at Washington by the Chairman of the Board of Directors. Several shareholders took a considerably more violent view than this director, and urged that the canal should be finished "by a supreme effort," and that it should not be permitted to fall into the hands of the Americans "for the price of old iron." We do not observe, however, that any of them suggested the supreme effort of putting his hand into his pocket for $150,000,000.

The Steel Cars for the Reading.

We noted last week certain orders for steel cars placed by the Reading. One thousand of these, ordered from the Pressed Steel Car Company, will be similar in all respects to the cars now being built for the Pennsylvania Railroad Company and the Baltimore & Ohio Railroad Company. The 500 box cars ordered from the American Car & Foundry Company will have steel underframing. The 600 cars ordered from the Cambria Company will be high-side gondolas, 100,000 lbs. capacity, 34 ft. long inside.

Another Transmission Plant.

In the November Transactions of the American Institute of Electrical Engineers Mr. Henry Floy describes the new power plant and transmission line of the St. Croix Power Company, of Wisconsin. This is a plant to develop a large horse-power and transmit it 27 miles westward to St. Paul for the use of the St. Paul Gas Light Company. The transmission is at 25,000 volts. The total head available at the power plant on the Apple River, a branch of the St. Croix River, is 82 ft. The minimum flow of water in the stream would yield about 2,000 h.p. continuously, and during most of the year nearly twice that amount. The description of the plant, from the dam to the delivery in the city of St. Paul, is complete and instructive.

Disuse of Oil Fuel on a Torpedo Boat.

Orders from the Navy Department have stopped the experiments with oil fuel on the torpedo boat "Talbot," and the boat will at once be re-fitted for coal burning. The opinion in the Navy Yard at Brooklyn seems to be that the Government would make no further experiments with oil as a fuel.

A Steel Car Plant for Alabama.

The Southern Car & Foundry Company, which has car building works at Memphis, Tenn., and Gadsden and Anniston, Ala., will remove the Memphis plant to a site in the Birmingham district, near Ensley, Ala., on property given by the Tennessee Coal, Iron & Railroad Company, which is to furnish material for about 10 steel cars a day.

THE SCRAP HEAP.

The Cotton Crop.

The Statistician of the Department of Agriculture estimates that the cotton crop for the crop year 1900 and 1901 will be 10,100,000 bales. The commercial crop for the year ended Aug. 31 last was 9,142,838 bales. This was 2,000,000 bales less than the crop of 1898 and 1899, which was the largest crop we ever made. Yet this smaller crop realized to the owners $29,000,000 more than the larger crop, owing to the appreciation in price.

Railroads on the Island of Crete.

The Government of Crete has decided that all the rolling stock as well as the material required for the narrow gage railroad lines to be built across the island shall be admitted duty free. The first section to be built will have a length of 100 kilometers, and will lead through the low lands of Messara. The town of Heraclea has been selected as the central point of this section. As, however, the law of the island requires that the plans must be approved by the Chamber, which does not meet until March, 1901, there seems to be no hurry in placing orders.

Mr. Charles H. Cramp on Forced Draft.

In a recent letter Mr. Charles H. Cramp, commenting on forced draft in marine practice, points out that "the maximum steam generating capacity of the Scotch boiler cannot be attained without forced draft equal to 2 in. of water in the tube with closed fire room or ash-pit or induced draft equivalent to it. The difference between natural draft and forced draft in a Scotch boiler is usually equal to 25 or 30 per cent. of the normal. Therefore, if it is contemplated to attain with natural draft a performance equal to that of forced draft with Scotch boilers, the weights must be increased in ratio of the difference. This would be out of the question in any type of warship now worth consideration. Indeed, the time is near at hand when the same rule will be recognized as applying with equal force to the higher classes of passenger vessels."

A Bridge Over the Bosphorus.

Certain Europeans, and particularly Germans, are trying to promote a scheme for building a railroad bridge over the Bosphorus which would unite the European and Asiatic railroads of the Turkish Empire, and thus unite the railroads of the continents of Europe and Asia. The width of the Bosphorus at the narrowest place is a little over 2,000 ft., and it is proposed to place the bridge on the same site where in the year 513 B. C. Mandrokles built a pontoon bridge over which Darius marched with 800,000 Persian soldiers. We question if the historical association will have much influence on European capitalists.

The Amu-Daria Bridge.

The bridge across the Amu-Daria River, the ancient Oxus, the principal river of Central Asia, will soon be completed. The bridge on the Trans-Caspian Railroad will be one of the largest bridges in Asia. It is carried on 24 stone piers, and the superstructure consists of 25 steel arches, 14 of which had been erected up to the end of September last. The steel was turned out by the Briansk Iron Works in European Russia. The length of the bridge is 5,442 ft.

Rolling Stock for Sweden.

Advices from Stockholm are to the effect that the Swedish Railway Administration will expend in 1902 5,500,000 kroners for rolling stock. At the same time the administration asks for a credit of 13,000,000 kroners for new lines.

Dining Cars on German Railroads.

The dining cars of the German state railroads are not state property, but belong to a special company styled as "German Railroad Dining Car Company." In 1899, 15 new cars were introduced, which were built and equipped at a price of 882,300 marks, which gives an average of 58,820 marks, or about $14,705 per car. During the last part of the year the dining car company had altogether 34 cars running, and the gross receipts of the company amounted to 857,069 marks, out of which amount, after heavy amortization, a dividend of 10 per cent. was paid.

Automatic Sale of Railroad Tickets.

During the year 1899 the sale of 152 ticket automats of the Berlin City Railroad amounted to over 30,000,000 tickets. Friedrichsstrasse Station alone sold automatically 200,000 tickets per month, and about the same number was sold at Zoological Garden Station.

A Mechanics' Night School.

The Cleveland Twist Drill Company established some time ago a night school for its employees, the results of which have been extremely gratifying. The school numbers about 110 pupils—all employees of the company. There are three courses of study—arithmetic, mechanical drawing and English; one teacher for each branch. The school is in session two nights in the week, and begins one-half hour after the factory shuts down, thus giving the men time to eat their supper. The company furnishes tea and coffee free, and sells sandwiches, etc., from the lunch counter in the dining room; thus no time or car fare is lost in going home and having to return again. The pupils are at no expense in attending the school, except for books and drawing instruments; the teachers, room, lights, heat, blackboards, drawing tables, etc., are furnished by the company.

Egyptian Railroad Offices.

Notice is given that the administrative office in Egypt of the Delta Light Railways Co. and that of the Société Egyptienne des Chemins de Fer Agricoles have been transferred from Alexandria to Cairo and established in the Place de l'Hippodrome Ismallieh quarter.

Fast Run on the Boston & Albany.

On Saturday, Dec. 22, a special train, consisting of an engine and one car, was run from Springfield to Boston over the Boston & Albany, 98.6 miles, in 2 hours 1 minute, equal to 48.9 miles an hour. This train was run to carry the Governor of the State, the regular train, on which he had been traveling from Dalton, being two hours late. The time made is said to be the best ever made between these two cities; and it would have been nearly half an hour better except for accidental delays. The train left Springfield at 2:14 p. m. At Brookfield there was a delay of six minutes on account of a hot bearing on the engine, and at Worcester the engine had to be left, making a further delay of 17 minutes; at South Framingham the train waited four minutes for orders, and near Boston was delayed two minutes by a block signal, making the net time 92 minutes, equal to 64.3 miles an hour.

Compliments of the Season.

Employees' annual passes for the year 1901 have just been distributed by the officers of the Pennsylvania road at Harrisburg. These passes, good for the recipient and his wife, go to conductors and enginemen who have served 10 years with satisfactory records.

The Chicago & Eastern Illinois distributed the sum of $1,000 among its employees in Christmas gifts. It is said that at the request of the President of the road the employees selected a committee to decide who should be the beneficiaries of this money, and the committee decided to give eight men $100 each and two $75 each, the remainder to be distributed pro rata.

LOCOMOTIVE BUILDING.

The Hocking Valley has ordered five consolidation and five switch engines from the Brooks Locomotive Works.

The Grand Rapids & Indiana is reported to have ordered four engines from the Baldwin Locomotive Works.

The Louisville & Nashville has ordered 10 consolidation and five 10-wheel passenger engines from the International Power Co.

The Pere Marquette is reported to have ordered 18 engines from the Baldwin Locomotive Works. We referred to five of these last week.

The W. J. Carlin Co., of Pittsburgh, Pa., and not the Thomas Carlin's Sons Co., of Allegheny, ordered the 23 locomotives from the Dickson Locomotive Works, referred to Dec. 21. Twenty of these will be 12-ton saddle tank locomotives with 9-in. x 14-in. cylinders, and three 12-ton saddle tank locomotives with 10-in. x 16-in. cylinders.

The Illinois Central order, placed with the Pittsburgh Locomotive Works, and referred to last week, calls for 30 mogul freight engines, four 10-wheel passenger and five six-wheel switch engines, all for June, 1901, delivery. The freight engines will weigh 167,200 lbs., with 145,500 lbs. on the driving wheels and have 20-in. x 28-in. cylinders, and 56½-in. driving wheels; radial stay boilers, with a working steam pressure of 200 lbs., and 336 tubes 2 in. in diam. and 13 ft. long; fire-boxes, 120 in. long and 39½ in. wide, and tender capacities of 7,000 gals. of water and 15 tons of coal. The passenger engines will weigh 149,700 lbs. with 116,800 lbs. on the driving wheels, and have 19½-in. x 26-in. cylinders; 69-in. driving

wheels; Belpaire boilers, with a working steam pressure of 200 lbs. and 264 tubes 2 in. in diam. and 13 ft. 5⅛ in. long; fire-boxes 122½ in. long and 32¾ in. wide, and a tender capacity for 5,000 gals. of water and 10 tons of coal. The simple switch engines will weigh 118,900 lbs. and have 19-in. x 26-in. cylinders; 51-in. driving wheels; straight top boilers with a working steam pressure of 165 lbs., and 220 tubes 2 in. in diam. and 11 ft. 7 1-16 in. long; fire-boxes 112 in. long and 33¾ in. wide; and tender capacities for 3,000 gals. of water and 7 tons of coal. The specifications for all include Westinghouse brakes, M. C. B. automatic couplers, Nathan and Ohio injectors, U. S. or Jerome packing, Ashton safety valves, Leach sanding devices, Nathan lubricators, A. French springs, Ashton gages, and Westinghouse friction draft gear.

The Chicago, Rock Island & Pacific order with the Brooks Locomotive Works, mentioned in our issue of Dec. 28, calls for 53 10-wheel freight engines, one "Chautauqua" type passenger engine and six switchers. The freight engines will weigh 173,000 lbs., with 132,000 lbs. on the driving wheels and have 20-in. x 28-in. cylinders; 64¾-in. driving wheels; radial stay wagon top boilers with a working pressure of 200 lbs. and 333 tubes 2 in. in diam. and 15 ft. long; fire-boxes, 9 ft. 10 in. long and 3 ft. 4 in. wide; and a tender capacity for 5,500 gals. of water and 10 tons of coal. The passenger engine will weigh 162,000 lbs. with 87,000 lbs. on the driving wheels, and have 20-in. x 26-in. cylinders; 78½-in. driving wheels; radial stayed wagon top boiler, with a working pressure of 210 lbs. and 319 tubes 2 in. in diam. and 15 ft. 8 in. long; fire-boxes, 108 in. long and 74 in. wide; and a tender capacity for 5,500 gals. of water and 10 tons of coal. The switch engines will weigh 122,000 lbs. on the driving wheels, and have 19-in. x 24-in. cylinders; 52-in. driving wheels; radial stay top boilers, with a working pressure of 180 lbs., and 203 tubes 2 in. in diam. and 11 ft. long; fire-boxes, 8 ft. 5½ in. long and 33 in. wide; and the tender capacity for 4,000 gals. of water and 7 tons of coal. The specifications for all include Westinghouse brakes, Coffin process axles, Gollmar bell ringers, Janney couplers, Westinghouse friction buffers, Pyle-National electric headlight, Nathan injectors, Jerome packing, Ashton safety valves, Leach sanding devices, Nathan lubricators, Crosby gages and Scott springs.

The St. Louis Southwestern has ordered 10 10-wheel simple freight engines, five eight-wheel simple passenger and two six-wheel switch engines, for March and April delivery, from the Pittsburgh Locomotive & Car Works, as reported in our issue of Dec. 14. The freight engines will weigh 162,000 lbs., with 130,300 lbs. on the driving wheels, and have 20-in. x 26-in. cylinders; 61-in. driving wheels; extended wagon top boilers with a working steam pressure of 200 lbs., and 300 tubes 2 in. in diam.; fire-boxes, 120 in. long and 39 in. wide; and a tender capacity for 4,500 gals. of water and 12 tons of coal. The passenger engines will weigh 121,000 lbs. with 82,000 lbs. on the driving wheels, and have 18-in. x 26-in. cylinders; 68-in. driving wheels; extended wagon top boilers with a working pressure of 200 lbs., and 275 tubes 2 in. in diam. and 11 ft. 2 in. long; fire-boxes, 108 in. long and 33 in. wide; and a tender capacity for 4,500 gals. of water and eight tons of coal. The switch engines will have 100,000 lbs. on the drivers; 18-in. x 24-in. cylinders; 51-in. driving wheels; extended wagon top boilers with a working pressure of 200 lbs., and 190 tubes 2 in. in diam. and 11 ft. long; fire-boxes, 84 in. long and 33 in. wide; and a tender capacity for 2,500 gals. of water and five tons of coal. The specifications for all include Westinghouse brakes, Coffin process axles, Sargent brake-shoes, Smith safety couplers, Pyle-National electric and Buck headlights, Monitor injectors, U. S. piston and valve rod packings; Coale safety valves, Nathan lubricators, Crosby steam gages, and Safety steam-heating equipment on the passenger engines.

CAR BUILDING.

The Hocking Valley has ordered 2,000 coal cars from the Pullman Company.

Fox Bros. & Co., New York, are figuring on 100 flat and 50 box cars for a railroad in Porto Rico.

The Chicago, Milwaukee & St. Paul, it is reported, will build 250 refrigerator cars in its own shops.

The Chicago & Northwestern has ordered 1,000 box cars of 80,000 lbs. capacity from the Haskell & Barker Car Co.

The Northern Pacific has received bids on about 5,100 freight cars and it was expected at the time of going to press that they would be opened and acted upon Jan. 5.

The Philadelphia & Reading has ordered 20 passenger cars from the Harlan & Hollingsworth Co. and 10 from the Jackson & Sharp Co. They will be of the same type as those ordered by the road last year, and 10 of the cars will be equipped with wide vestibules.

The New York, New Haven & Hartford has ordered 27 passenger cars, with wide vestibules and Standard steel platforms, from the Pullman Co., and 20 coaches from Osgood Bradley & Sons. Of the 27 cars to be built by Pullman, 11 will be used as smoking cars and will be upholstered in leather and finished in oak. The 20 cars to be built by Osgood Bradley & Sons are for local service and will have open platforms. All of the cars will have Westinghouse brakes and Pantasote curtains, and will be lighted by Pintsch gas.

We noted last week the fact that the *Philadelphia & Reading* had placed orders for steel cars with a number of concerns. Among these are 500 box cars with steel underframes contracted for with the American Car & Foundry Company. These cars are to have superstructures in all respects in accordance with the Philadelphia & Reading standard practice for 30-ton box cars, while the underframes are to consist of pressed steel longitudinal sills with structural steel bolsters, end sills and other transverse members, and are also to be equipped with American Car & Foundry Company's draft gear for steel cars. All the equipment is to be mounted upon Fox pressed-steel trucks, the details of which are in accordance with Philadelphia & Reading standard practice.

BRIDGE BUILDING.

Akron, Ohio.—City Engineer John W. Payne informs us that the proposed bridge over the Little Cuyahoga River, called Cuyahoga street bridge, will be a concrete arch of 50 ft. and will probably be built during the coming summer.

Allentown, Pa.—Reports state that bids are being received for the bridge proposed by the Allentown & South Allentown Bridge Co., over the Little Lehigh River. R. S. Rathbun, Engineer. (Dec. 14, 1900, p. 832.)

Buffalo, N. Y.—We are informed that the contract for the foundations for the bridge on Seneca street, over Buffalo River, has been let to B. I. Crooker, Builders' Exchange, Buffalo; the superstructure and a temporary bridge to the American Bridge Co. (Buffalo plant).

Bids have just been received for a bridge on Delaware avenue, over Scajaquada Creek, for which the American Bridge Co. are the lowest formal bidders, for which they bid $8,400.

Charlevoix, Mich.—The Detroit Bridge & Iron Works got the contract, on Dec. 29, for the 168-ft. steel draw bridge over Pine River, at $19,800. It will have a 75-ft. draw and be 33 ft. wide.

Cleveland, Ohio.—We are informed that bids will be received by William E. Sage, Clerk, Board of Control, on Jan. 22, for the foundations and superstructure for a steel bridge 210 ft. long over the Cuyahoga River at Seneca street. The bridge is a double rolling lift of the Scherzer type, with 120-ft. clear waterway, 138 c. to c. bearings, and 210 ft. over all. The estimated cost is $100,000. James Ritchie is City Engineer.

Detroit, Mich.—The Michigan Central will, within 30 days, build the through plate girder bridge over the tracks of the Michigan Central, Lake Shore and the Grand Trunk Railroads, on Woodward avenue.

Duluth, Minn.—An agreement is reported made between the city and the Northern Pacific in relation to the Garfield avenue viaduct. City Engineer McGilvray recently informed us that the contract would probably be let this winter.

Fredericton, N. B.—The Department of Public Works wants bids for rebuilding Rockwell bridge in the parish of Burton, Sunbury County; also for rebuilding King's bridge over Swan Creek in the same parish, and for rebuilding Gilchrist bridge in the parish of Northfield, same county.

Hull, Que.—The Railway Committee of the Privy Council has approved the plans, profiles and elevations of the highway crossings in connection with the Interprovincial bridge in Hull, which include an overcrossing of Laurier avenue and the Hull Electric Railway in the city of Hull; an overcrossing Government road west end of St. Patrick street; also plan of superstructure over same; plan showing proposed headway under Dufferin bridge and plan showing proposed headway under Sapper's Bridge.

Kansas City, Mo.—Negotiations between the Belt Railway Co. and the Park Board regarding the proposed Benton Boulevard bridge over the railroad tracks are expected to be completed next week, and the contract let some time during the winter.

La Platte, Neb.—The Burlington & Missouri River R. R. will build a bridge over the Platte River near this place.

Lyons, N. Y.—An appropriation will be asked of the State at the opening of the Legislature, to build a lift-bridge across the Erie Canal on Geneva street to do away with the steep grades to the present bridge.

Merrill, Wis.—We are informed that the contracts for the two steel bridges at this city were let, on Dec. 29; one to the Milwaukee Bridge & Iron Co., and the other to W. S. Hewett, of Minneapolis.

Mountayr, Iowa.—We are informed that bids will be received by J. T. Wall, County Auditor, on Jan. 15, for four steel spans.

Niles, Ohio.—The County Commissioners, according to report, will soon meet at this place to consider building a bridge over the creek on Robbins avenue.

Olean, N. Y.—We are informed that a steel bridge 238 ft. long, and four wooden bridges will be needed on the railroad to be built by the J. R. Droney Lumber Co. (See Railroad Construction column.)

Ottawa, Ont.—The Ottawa Improvement Commission (Stephen E. O'Brien, Secretary) has decided to build a bridge over the Rideau Canal at Somerset street.

The Railway Committee of the Privy Council gave a hearing last week on the application of the township of Nepean for a subway or overhead crossing of the Canadian Pacific and Canada Atlantic railroad tracks, a few rods west of Richmond road or Elm street.

Peshtigo, Wis.—A steel bridge will be built over Peshtigo River, by the county and the city. W. W. Hall, Town Clerk.

Pine Bluff, Ark.—We are informed that Jefferson County contemplates building a steel drawbridge across the Arkansas River at Pine Bluff. It will be about 1,150 ft. long. The bridge, which is to be a free highway, will have to be authorized by Congress before bids will be asked. The work will probably cost $250,000. No plans are made. Address E. D. Russell, Secretary, Commercial Bridge.

Pittsfield, Mass.—According to report, a footbridge to cost $20,000 will be built in the spring over the east branch of the Housatonic River near the gas works.

The city and the street railroad are reported to have reached an agreement regarding the proposed bridge on South street. (Oct. 26, 1900, p. 710.)

Pontiac, Mich.—A bridge will be built over West Lawrence street early next year.

Plans are being made by the City Engineer for a stone arch bridge over Clinton River at Orchard Lake avenue. Wm. J. Fisher, City Engineer.

Portland, Me.—Plans for a steel bridge at Sprague's Falls on the Washington county road have been made and the structure will be built in the coming spring.

Portsmouth, N. H.—The plans for the new bridge which will cross the river between Kittery and the navy yard have been sent on to Washington. The bridge will be built in the spring for the railroad to be built at the navy yard.

Providence, R. I.—Regarding the bridge at Chattlet and Eagan streets, over the Woonasquatucket River, mentioned in this column Dec. 21, p. 850, we are informed that it is as yet only a proposition by the councilmen. City Engineer Otis F. Clapp says the place is a good one for a bridge. The territory on the west side of the river, which was in the Town of Johnston, became, by annexation two years ago, a part of Providence.

Reading, Pa.—Architect J. J. Deery, Betz Bldg., Philadelphia, Pa., is reported to have plans made for a large double track railroad bridge over the Schuylkill River at Reading, for the Reading Bridge & Warehouse Co. The structure is to be of steel and more than 2,000 ft. long. (Dec. 21, 1900, p. 850.)

St. Joseph, Mich.—The Indiana, Illinois & Iowa Railroad has permission from the State to build its proposed bridge over St. Joseph River at this city. It will have a 150-ft. draw.

St. Thomas, Ont.—The Lake Erie & Detroit River Ry. has let a contract to the Canada Bridge Co., which was recently incorporated and has office at Walkerville, Ont., for the superstructure of the steel viaduct across Kettle Creek ravine on the west side of the city. The viaduct will be a steel structure, 1,215 ft. long and 97 ft. high from pedestal to base of rail. There will be 23 spans and 11 towers. The girder spans will be 60 ft. and the tower spans 40 ft. each. The substructure will be concrete masonry, the contract for which is let to Messrs. Ponsford Bros., of St. Thomas. The total estimated cost will be $74,000.

San Domingo.—Contracts will be let, on Jan. 9, for rebuilding the Ozama bridge between the capitol and the villa Duartee. Particulars may be had of El Ministerio de Fomento y Obras Publicas, San Domingo.

Shenango, Pa.—The Pittsburgh, Bessemer & Lake Erie has let a contract to the Toledo Bridge Co., at $10,300, for a steel bridge 154 ft. long over Shenango Creek, to replace the present light structure. The new bridge will be set on the present masonry, and is designed for 192½-ton engines.

Stockton, Cal.—The County Supervisors have adopted plans and specifications for the proposed steel bridge across the San Joaquin River at Dunham's Ferry. Bids will be asked as soon as permission to build is received from the Secretary of War. The estimated cost is $19,000. The steel draw span will be 260 ft. long.

Toledo, Ohio.—The County Commissioners will sell $58,000 bridge bonds on Jan. 10. Wm. M. Godfrey, County Auditor.

Trenton, N. J.—The Pennsylvania R. R. will build a new bridge over the Delaware River in connection with change of line on both sides of the river.

Victoria, B. C.—A permanent bridge to replace the temporary structure at Point Ellice is estimated to cost $45,000.

Welland, Ont.—The matter of rebuilding the Montrose bridge in Chippewa is again under consideration.

Wheeling, W. Va.—Contracts are about to be let for building parts of the Pittsburgh, Connellsville & Wheeling railroad. There are 75 bridges on the line. Two over Wheeling Creek will require two spans each of 150 ft. The bridges are to be of steel. The approximate cost of the masonry and bridges is $1,250,000. John Wilson, Chief Engineer.

Wingham, Ont.—The Board of County Commissioners has recommended that several bridges be built next year, including the Mitchell bridge and Boehler bridge. The superstructure to be of steel and abutments of concrete.

Woolstock, Iowa.—A new bridge will be built near Woolstock by the Supervisors of Wright and Hamilton counties.

Other Structures.

Bonham, Tex.—The Texas & Pacific, it is announced, will begin work in January on a pressed brick depot in Bonham.

Boston, Mass.—The Boston & Maine, according to report, has plans made for increasing the capacity of the grain elevator at Mystic docks.

Buffalo, N. Y.—The New York Central & Hudson River R. R. will build a temporary passenger shed west of its present Exchange street station. The structure is planned to be 520 ft. long, 36 ft. wide and 16 ft. high, and used for increased terminal facilities during the Pan-American Exposition.

Conneaut, Ohio.—The Pittsburgh & Conneaut Dock Co. is arranging to build three ore conveyors, 450 ft. long, 250 ft. clear span, and 150 ft. cantilever, with 10-ton ore cars.

Denver, Colo.—The Steel Tired Wheel Co., of New York, is building a new factory to make steel tires for car wheels, also power house and machine shop.

Joliet, Ill.—The Fox Pressed Steel Car Works, operated by the Pressed Steel Car Co., was damaged by fire to the extent of about $100,000 on Dec. 24.

Lewes, Del.—Bids will shortly be wanted by the Queen Anne's Railroad for building a pier at Lewes.

Nashville, Tenn.—The contract for the second freight depot to be built by the Louisville & Nashville, on Walnut street, at Church, is let to N. G. & C. W. Rives, of Nashville. The building is to be two stories high, of brick, being 60 ft. wide and about 1,000 ft. long.

New York, N. Y.—The Secretary of the Treasury has let a contract for the foundation of the New York Custom House to Isaac A. Hopper, of New York. The contract price is $369,610 and provides for the excavation, foundations, masonry, walls and structural steel for the basement of the proposed building. The work is to be finished in eight months.

Oskaloosa, Iowa.—New machinery is to be placed in the Oskaloosa roundhouse and shops of the Iowa Central. A new warehouse will also be built.

Raton, N. Mex.—The Atchison, Topeka & Santa Fe will build a passenger and freight depot at this place.

Reading, Pa.—Plans are being made by J. J. Deery, Betz Bldg., Philadelphia, Pa., for a large six-story brick and iron frame storage warehouse to be built in Reading for the Reading Bridge & Warehouse Co. It will be 300 x 80 ft.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xi.)

Canadian Society of Civil Engineers.

At the meeting on Thursday, Jan. 3, a paper on "Masonry Dams and Retaining Walls in General, Concrete Works, Etc., was read by Mr. Charles Baillairge.

The Railway Signaling Club.

The next meeting of this club will be held on Jan. 15 at 2:30 p. m., at the Great Northern Hotel, Chicago.

A paper entitled "Derailments, and Conclusions to Be Drawn Therefrom," by W. H. Elliott (C., M. & St. P.) will be presented.

American Society of Civil Engineers.

We again call attention to the fact that the 48th Annual Meeting of the Society will be held in New York, Jan. 16 and 17, beginning at 10 o'clock on the morning of the 16th. Messrs. Joseph O. Osgood, R. S. Buck, Albert Carr and Charles Warren Hunt are the Committee of Arrangements, and are preparing a programme.

The 33d Annual Convention of the Society (summer convention) will be held at Niagara Falls, N. Y., June 25 to 28, inclusive.

At the regular meeting of Jan. 2 Mr. Grimm's paper on "The Kinzua Viaduct of the Erie Railroad Company" was presented for discussion. This was printed in the November *Proceedings*, and a pretty careful description of the structure appeared recently in the *Railroad Gazette*.

At the meeting of Feb. 6 a paper by Prof. Crandall, of Cornell, will be presented for discussion on "The Adjustment of the Transit Survey as Compared with That of a Compass Survey." This paper is printed in the December Proceedings.

At the meeting of Feb. 20 a paper will be presented by Mr. G. N. Houston on "The Construction of Gravity Sand Filters at Nyack, N. Y.," which is printed in the December Proceedings.

The Engineers' Club of Philadelphia.

A business meeting of the club will be held on Saturday, Jan. 5, at 8 o'clock p. m. The paper of the evening will be "An Informal Illustrated Lecture on the New Croton Dam, New York," by Charles S. Gowen, Chief Engineer.

At the meeting on Dec. 1 Mr. James Christie presented a paper upon the special subject of "High-speed Toothed Gearing." With the aid of blue-print illustrations he described four cases in which toothed gearing had recently been used to transmit power with high pressure per unit of tooth-contact at a high peripheral speed. Data were given for the sizes and speed of the wheels and the composition of the steel of which they were made. The advantages of the involute over the cycloidal curves for the profile of gear-teeth were mentioned, and the desirability of adopting a uniform angle of obliquity for involute teeth was pointed out.

Mr. Wilfred Lewis followed with a communication upon "Interchangeable Gearing." The practical fallacy of the claim for superiority made by some writers on behalf of cycloidal over involute teeth was pointed out, and the question of the most desirable angle of obliquity to use for interchangeable involute teeth was fully discussed. Mr. Lewis recommended 22½ deg. as a convenient angle to adopt, and one that could be used for a pinion of twelve teeth without perceptible interference. He suggested that the club might initiate some action by which standard proportions for interchangeable gearing could be generally adopted.

The general subject was discussed by Messrs. Erwin Graves, L. F. Rondinella, James Christie, Carl Hering, Wm. C. L. Eglin and Willibald Trinks.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. M. D. Nelon, Superintendent of Floating Equipment of the Illinois Central, died at Paducah, Ky., Dec. 23, aged 54.

—Mr. E. P. Campbell, at one time Auditor Traffic of the Erie, died Dec. 30. He was a graduate of the Pennsylvania State College.

—Mr. A. B. Stickney, President of the Chicago Great Western, was married on New Year's Day to Miss May Crosby, second daughter of Judge J. Crosby, of Dexter, Me.

—Mr. W. E. Jones, who has been Treasurer of the Baltimore & Ohio Southwestern for several years, died suddenly Dec. 23 at his home in Cincinnati. Mr. Jones was 53 years old.

—Mr. A. T. Drew, General Freight Agent of the Missouri, Kansas & Texas, died Tuesday, Dec. 25, from concussion of the brain caused by a fall from his horse while riding in Forest Park, St. Louis. Mr. Drew was born in Magnolia, Ill., in 1860.

—Mr. Emil Swensson, M. Am. Soc. C. E., Manager Keystone Bridge Works Branch, American Bridge Company, resigned his position Dec. 31, 1900. His plans for the future have not yet been decided, except that he will take a rest before engaging in work again. Mr. Swensson has been connected with the Keystone Bridge Works for 14 years, starting as a draughtsman, then engineer in charge Draughting Department, Superintendent of the Keystone Bridge Works, Chief Engineer and Superintendent, and finally Manager for the American Bridge Company. His experience has been extensive, especially in the design, manufacture and erection of many railroad bridges and mill buildings.

—Mr. William Westlake, an inventor of considerable fame and one of the founders of the Adams & Westlake Company, died last Friday morning, Dec. 28, at his home in Brooklyn, N. Y. He was born in Cornwall, England, in 1831, and came to the United States when he was 16 years old. He learned the trade of a tinsmith, and was employed by the La Crosse & Milwaukee Railroad (now Chicago, Milwaukee & St. Paul) as a tinsmith and coppersmith. While there he invented the Westlake car heater, a loose globe lantern and various other things. He was ingenious and persistent in developing a lamp for burning kerosene oil in railroad cars. In 1877 he retired from the Adams & Westlake Company, and in 1883 retired from business.

—Mr. William Channing Cushing has been appointed Superintendent of the Pittsburgh Division of the Pennsylvania Lines West of Pittsburgh, succeeding Mr. Geo. L. Peck, Mr. Cushing's former position having been that of Engineer of Maintenance of Way at Pittsburgh. He was born March 18, 1863, at St. John, N. B., and educated at the University of New Brunswick and at the Massachusetts Institute of Technology. He entered railroad service in 1887 and has been continuously in the engineering department of the Pennsylvania or subordinate lines ever since. Mr. Cushing was elected a Junior of the American Society of Civil Engineers in 1889 and an Associate Member in 1891. He has long been recognized as one of the coming men on the Pennsylvania System.

—Mr. Reuben A. Dugan, Assistant General Manager of the Elgin, Joliet & Eastern and the Chicago, Lake Shore & Eastern, was born at St. Charles, Mo., July 27, 1865. He entered railroad service Jan. 1, 1882, as a messenger in the General Manager's office of the Missouri Pacific. He served as clerk in various offices of the Texas & Pacific from June 22, the same year, becoming chief clerk in November, 1883, for the Superintendent of Telegraph at Marshall, Mo. He was chief clerk to the General Manager of the Iowa Central at Marshalltown, Iowa, from April, 1880, and continued with that road until July, 1892, serving as Fuel Agent from September, 1889, and as Purchasing Agent from March 17, 1890. He entered the service of the Elgin, Joliet & Eastern as Purchasing and Fuel Agent on Aug. 1, 1892, and held the same office with the Chicago, Lake Shore & Eastern in addition after April 10, 1899. His present appointment took effect Dec. 12.

—Mr. Allen G. Mitchell, appointed Superintendent of the Monongahela Division of the Pennsylvania Jan. 1, was born at Madison, Somerset County, Me., Feb. 3, 1855. He took the degree of civil engineer from the University of Maine in 1875, and began his railroad service the same year as a rodman on the Somerset R. R. After spending five years in civil engineering and land surveying in Somerset County, he entered the service of the Pennsylvania in March, 1880, as a rodman, and with the exception of two years from February, 1882, when he was with the H. C. Frick Coke Company, he has remained continuously with the Pennsylvania. He served as transitman and assistant engineer in the office of the Engineer of Maintenance of Way to September, 1884, when he became Assistant Supervisor of the Middle Division. From January, 1886, he had a similar position in the Philadelphia yard, and in November, 1887, became Supervisor of the Monongahela Division at Monongahela City. In December of the following year he was made Supervisor of the Pittsburgh Division, and on Jan. 1, 1891, Assistant Engineer of the Monongahela Division, with office at Pittsburgh, in which position he continued until his change on Jan. 1, last.

—Lord Armstrong died at his home, near Newcastle-on-Tyne, England, Dec. 27, being upwards of 90 years old. He was one of the greatest engineers and men of affairs of the century just ended. He was born in 1810, being the son of a merchant in Newcastle-on-Tyne. He was educated as a lawyer, and practiced until he was 37, when he turned his attention definitely to engineering. His first great achievements were in hydraulic machinery, and he was the father of the modern high-pressure hydraulic plant as a means of handling material and doing work. To build machinery of his designs he started the Elswick Engineering Works. Then his attention being called to the condition of the British artillery during the Crimean War, he began the careful and thorough study of artillery, which resulted in a line of inventions in ordnance of the first importance, and he was appointed Engineer of Rifled Ordnance to the Government. This position he resigned shortly after, however, and the works at Elswick developed into a great arsenal and shipyard, where a vast amount of material for use in peace as well as in war has been produced. Rear Admiral O'Neil, of the U. S. Navy, Chief of the Bureau of Ordnance, says that Lord Armstrong was a pioneer in the combination of ships, armor and ordnance, and that he was an artillerist of distinction. Charles H. Cramp says that he was a great man, and that the ships turned out of his yard were the best of their kind in the world. Irving M. Scott, of the Union Iron Works, says that Lord Armstrong did more for the evolution of shipbuilding than any man of his time. He was not only a leader in the design of ships and their armament, but "he set the pace in the matter of the rapid production of war vessels."

—Mr. George L. Potter succeeds Mr. Loree as General Manager of the Pennsylvania Lines West of Pittsburgh.

He was born in Bellefonte, Dec. 28, 1856, and entered the shops of the Philadelphia & Erie road at Renovo in 1876. In 1882 he was made assistant to the Master Mechanic at Fort Wayne of the Western Lines, and in 1887 Master Mechanic at the Fort Wayne shops. In 1893 he was appointed Superintendent of Motive Power of the Northwest System, and in 1899 General Superintendent of Motive Power of the Pennsylvania System West of Pittsburgh, a new office. Mr. Potter is industrious and energetic to a degree rare even among road men, and his ability has long been manifest to the motive power officials in whose Association he has done valuable work. His judicial temper was recognized by his appointment to the chairmanship of the Arbitration Committee of the Master Car Builders' Association. Mr. Potter has worked with Mr. Loree in the recent development of locomotives and freight cars of great power and capacity, with which movement our readers are somewhat familiar. In certain districts between Pittsburgh and the lakes trains of 3,250 tons are now regularly hauled, and on one division the average *revenue* load was 697 tons in 1899, and probably was close to 800 tons in 1900. It must be remembered that this includes local freight, merchandise, coke, etc. Probably this is as fine a performance as can be found anywhere, possibly the best, and in this the Motive Power Department has had its share of the work if not of the glory. In other directions Mr. Potter has displayed judgment and personal force, the qualities that the Pennsylvania directorate seek in the young men on whose shoulders they place the burden and to whom they give the reward.

ELECTIONS AND APPOINTMENTS.

Ann Arbor.—Dr. W. H. Hutchings has been appointed Chief Surgeon, with headquarters at Ann Arbor, Mich., succeeding Dr. W. J. Herdman.

Baltimore & Ohio.—The jurisdiction of A. M. Lane, Superintendent of the West Virginia & Pittsburgh Division, at Weston, W. Va., has been extended over the Monongahela Division, succeeding H. G. Bowles, resigned.

Central Vermont.—W. H. Chaffee has been elected Clerk and Treasurer, succeeding R. H. Ingram, resigned.

Chicago, Rock Island & Mexico.—The officers of this company are: M. A. Low, Topeka, Kan., President; J. H. Conlin, Twist, Texas, Vice-President, and Dwight Ford, Secretary and Treasurer. (See R. R. Construction column, Dec. 14, p. 834.)

Cumberland & Pennsylvania.—E. P. McKenna has been appointed General Freight and Passenger Agent.

Delaware & Hudson.—D. Willcox has been elected Vice-President, succeeding the late James Roosevelt.

Erie.—Geo. Sergeant, Jr., has been appointed Engineer Maintenance of Way, succeeding J. R. W. Davis, resigned, effective Jan. 1.

C. P. Lamprey has been appointed General Manager of the Erie Despatch, succeeding Geo. F. McKay, resigned.

Evansville & Terre Haute.—A. C. Hone has been appointed Superintendent, succeeding W. M. Corbett, resigned. Mr. Hone's jurisdiction will embrace the transportation and mechanical departments. W. J. McLeish succeeds Mr. Hone as Superintendent of Motive Power and Rolling Stock.

Findlay, Fort Wayne & Western.—J. A. Hansgen, Master Mechanic at Findlay, Ohio, has resigned.

Grand Trunk.—Charles Percy having resigned, Frank Scott has been appointed Treasurer, effective Jan. 1. William Wainwright, on Jan. 1, became General Assistant and Comptroller.

Keokuk & Western (Chicago, Burlington & Quincy).—On Jan. 1, the jurisdiction of all officers of the K. & W. (with the exception of Roadmaster) was extended over what has heretofore been known as the Humeston & Shenandoah Railway, which is operated as a part of the K. & W. The following appointments have been made: A. McCrae, General Freight Agent; H. S. Nelson, Assistant General Freight Agent; W. G. Goodrich, General Passenger Agent; and Chas. Schultz, Roadmaster.

New York Central & Hudson River.—George Thompson, having been granted leave of absence for one month, from Jan. 1, 1901, John Howard will, until further notice, perform the duties of Division Superintendent of Motive Power of the Pennsylvania Division, with headquarters at Corning, N. Y., with the title of Acting Division Superintendent of Motive Power, effective Jan. 1. H. M. Butts, heretofore Supervisor of Passenger Equipment, has been appointed Master Car and Locomotive Painter, with headquarters at West Albany shops.

New York, Philadelphia & Norfolk.—The position of General Passenger and Freight Agent, at Norfolk, is abolished. The jurisdiction of J. G. Rodgers, Superintendent, has been extended to cover the operation of the Norfolk Ferry, together with the Station Agencies at Norfolk, Port Norfolk, Portsmouth and Old Point Comfort, effective Jan. 1.

Northern Alabama (Southern).—H. E. Hutchens has been appointed Superintendent, succeeding R. B. Pegram, resigned. (See Southern.)

Pennsylvania Company.—At a meeting of the Board of Directors, held Dec. 26, the organization of this company was amended and the following changes took effect Jan. 1: James McCrea, as First Vice-President, will, under the direction of the President, attend generally to the executive business; Joseph Wood, as Third Vice-President, will have supervision of the Traffic and Accounting Departments; and L. F. Loree, who has just been elected Fourth Vice-President, will be in charge of the Transportation Department. On the same day the following appointments were made: G. L. Potter, heretofore General Superintendent Motive Power, becomes General Manager, succeeding Mr. Loree; Thomas H. Johnson, Consulting Engineer, succeeding Felician Slataper, resigned; Charles S. Covert, Auditor of Passenger Receipts, succeeding J. P. Farley, retired under pension; E. W. Dunbar, Assistant Auditor of Passenger Receipts, succeeding Mr. Covert; Frank C. Thayer, Superintendent of the Voluntary Relief Department, succeeding R. F. Smith, retired under pension, and John Dodds, Assistant Superintendent of the same department, succeeding Mr. Thayer.

Mr. Loree was also elected Fourth Vice-President of the Pittsburgh, Cincinnati, Chicago & St. Louis (Southwest System), and the following changes become effective, Jan. 1, on this system: G. L. Potter becomes General Manager, succeeding Mr. Loree; G. L. Peck, General Superintendent, succeeding John F. Miller, retired under pension; Thomas Rodd, Chief Engineer, succeeding Mr. Johnson; Robert Trimble, Principal Assistant Engineer; W. C. Cushing, Superintendent of the Pittsburgh Division, succeeding Mr. Peck. The jurisdiction of Messrs. Johnson, Covert, Dunbar, Thayer and Dodds will also extend over the P., C., C. & St. L.

The Chief Engineer's Department of the Northwest and Southwest Systems, having been consolidated, the following appointments have been made: J. C. Bland, Engineer of Bridges, in charge of all culvert and bridge work; E. G. Ericson, Assistant Engineer in charge of maintenance of way, and such construction work as is carried on by the Chief Engineer's office directly, other than bridges and culverts; both to be under the supervision of the Chief Engineer. G. H. Burgess becomes Assistant Engineer, in charge of such duties in connection with engineering as may be assigned to him by the General Manager, Chief Engineer or Engineer of Bridges.

Santa Fe, Albuquerque & Pacific.—The officers of this company, referred to in the Construction column, are: President, Hon. W. H. Andrews, of Pennsylvania; Vice-President, Hon. W. S. Hopewell, Hillsboro, N. Mex.; Treasurer, J. T. McLaughlin, San Pedro, N. Mex.; Secretary, Hon. Joseph E. Saint, Albuquerque, N. Mex.

Southern.—W. H. Peddle has been appointed General Superintendent of Transportation, succeeding J. H. Barrett, resigned to accept a position with another company. R. B. Pegram succeeds Mr. Peddle as Assistant General Manager. H. E. Hutchens becomes Superintendent of the Memphis Division, succeeding Mr. Pegram, and in turn is succeeded by A. Ramseur, as Superintendent of the Norfolk Division; W. A. Turk has been appointed Assistant Passenger Traffic Manager at Washington, D. C., and is succeeded as General Passenger Agent by S. H. Hardwick. W. H. Tayloe becomes Assistant General Passenger Agent at Atlanta, succeeding Mr. Hardwick, effective Jan. 1. After the date

just mentioned the old Louisville, Evansville & St. Louis, together with the Louisville Division between Georgetown, Lexington, Burgin and Louisville, Ky., will be operated as the "St. Louis-Louisville Lines," and the following appointments have been made: H. B. Spencer, Assistant General Manager, with headquarters at Eighth and Olive streets, St. Louis, Mo.; C. P. Cooper, Accountant to the General Manager, at St. Louis, Mo.; M. A. Zook, Engineer Maintenance of Way, Louisville, Ky.; W. K. Morley, Superintendent, Louisville, Ky.; R. M. Boldridge, Master Mechanic, at Princeton, Ind; R. A. Campbell, Assistant General Freight Agent of the St. Louis Division, at St. Louis, Mo.; Edwin Fitzgerald continues to perform the duties of Assistant General Freight Agent of the Louisville Division, at Louisville, Ky. R. E. L. Bunch has refused to accept the position of Assistant General Passenger Agent of the St. Louis-Louisville Lines; having accepted service elsewhere. All communications respecting passenger traffic of the St. L.-L. Lines should, until further notice, be addressed to R. A. Campbell, Acting Assistant General Passenger Agent at St. Louis, Mo. The jurisdiction of the First and Second Vice-Presidents is extended over the new division.

Southern Illinois & Missouri Bridge.—The officers of this newly incorporated company are: President, C. G. Warner; Vice-President, M. J. Carpenter; and Secretary and Treasurer, C. W. Hilliard. (See R. R. Construction column, Dec. 21, p. 852.)

Southern Pacific.—R. H. Ingram, heretofore Treasurer of the Central Vermont, has been appointed Secretary to the new President of the S. P.

Wheeling & Lake Erie.—F. C. Gates, Purchasing Agent, having resigned to engage in other business, the duties of that office will be assumed by the Assistant to General Manager, J. E. Taussig. Mr. Taussig has also been appointed Superintendent of Telegraph, effective Jan. 1.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Alberta Central.—Mr. George W. Greene, of Red Deer, Alberta, has given notice of an application to the Dominion of Canada for an act to incorporate this company to build a railroad from a point in Township 38, Range 23, west of the fourth meridian in the District of Alberta in the Northwest Territories, west to a point in the Village of Red Deer, thence west to a point in Township 38, Range 7, west of the fifth meridian.

Baltimore & Ohio.—A letter from J. R. Droney Lumber Co., of Olean, N. Y., states that his company has surveyed a line from Confluence, Pa., on the Baltimore & Ohio, southeast 25 miles via Hardensville, Dumas, Listonburg and Unamis, Pa., to a point in Somerset County on the Maryland line. No contracts are let. The maximum grade is 2 per cent., and the maximum curve 15 deg. (Dec. 21, p. 851.)

British Columbia Roads.—Messrs. Bodwell & Duff, solicitors of Victoria, B. C., are making application to the British Columbia Legislature to incorporate a company to build a railroad from a point on the line of the Canadian Pacific at or near the outlet of Kamloops Lake, thence by the most feasible route to the plateau of the Bonaparte River, thence to a point on Cariboo wagon road near the Hundred-mile House, thence to some point near the headwaters of the Beaver River, and along that river to the confluence of the Quesnelle with the Fraser Rivers; with a branch to some point in the vicinity of Williams or Antler Creek in the Cariboo district.

Messrs. Hunter & Oliver, solicitors of New Westminster, are applying to the British Columbia Legislature to incorporate a company to build a railroad from a point on Burrard Inlet, at or near the city of Vancouver, thence via the city of new Westminster east along the south side of the valley of the Fraser River between the junction of the Chillwack River with the Fraser River and the town of Yale, thence east along the valley of the Chillwack-Tulameen and Similkameen Rivers, or some of them to a point between Penticton and the International boundary, on the water course connecting Okanagan and Osooyoos lakes; thence to a point on the Kettle River at or near Rock Creek, thence to Midway and Grand Forks, B. C., with branches not to exceed 30 miles.

Calvert, Waco & Brazos Valley.—The Attorney General of Texas, on Dec. 28, approved of the amended charter which provides for an extension, both north and south, so that the line is to run from Spring, Tex., north to Fort Worth, about 228 miles. Some 68 miles is completed. The road is to be operated as a part of the International & Great Northern. (Dec. 7, p. 817.)

Cambria Terminal.—Building is under way on this line, whose incorporation was recently noted, from a point in East Taylor township, Cambria County, Pa., through Johnstown, seven miles. Surveys are finished, the route located and the grading about one-third completed. There are 100 men at work. (Dec. 21, p. 851.) Powell Stackhouse, of Philadelphia, is President, and M. G. Moore, of Johnstown, Engineer. (Official.)

Canada Atlantic.—This company will ask authority to build a branch from Galetta, in Fitzroy township, in the county of Carleton, Ont., north across the Ottawa River to a point on the Pontiac Junction Ry. between Quyon and Shawville in Pontiac county, Que.; also to extend to Arnprior in Renfrew county, Ont.

Central of Georgia.—An officer confirms the report that a survey is being made for the proposed extension of the Bruton & Pineora line from Register east to connect with the main line. The engineers are instructed to run three or four lines. (Dec. 21, p. 851.)

Chateauguay.—This company has decided to lay a third rail on its road from Cadyville to Dannemora, N. Y., thus making it standard as well as a narrow gage.

Chicago, Covington & Southwestern.—Plans are reported under way for building this proposed line from Chicago, Ill., southeast about 160 miles, via Covington, Ind., to Terre Haute. Bayard Taylor is Secretary, and Charles N. Roberts, Engineer, both of Chicago.

Chicago, Rock Island & Pacific.—Contracts are reported let for the first 100 miles of the extension from Liberal, Kan., to a connection with the El Paso & Northeastern, to Creech & Lee, of Kansas City, Mo., 50 miles, and to Winston Bros & Craney, of Minneapolis, Minn., 50 miles. (Dec. 21, p. 851.)

Denver & Rio Grande.—Surveys are reported under way for a branch from Moffat, Colo., to run east 23 miles to Crestone.

Florida Roads.—The Florida Peninsular Transportation Co. was incorporated in Florida, Dec. 28, with a capital stock of $1,000,000, to build an electric railroad from St. Petersburg around Tampa Bay to Tampa, and to maintain several water lines of transportation.

Glassport Terminal.—This company was incorporated in Pennsylvania, Dec. 28, with a capital stock of $50,000, to build a line from a point on the McKeesport & Belle Vernon R. R. in Allegheny County, to a point in Jefferson township of the same county, five miles. The directors are: George H. Flinn (President), William J. Wiseman, W. C. Lynne, and J. W. Patterson, Pittsburgh.

Gulf Terminal, Orange & Northern.—The incorporation is sought, in Texas, for this proposed line from Orange north about 35 miles to a point near Ford's Bluff. E. L. Reeves, of Chicago, is promoter.

Illinois Central.—Surveys are reported in progress for an extension of the Yazoo Delta branch from Belzoni, Miss., south about 25 miles to Yazoo City. The line was recently completed from Isola south to Belzoni. (Construction Supplement, July 27, 1900.)

Intercolonial.—The Hon. Mr. Blair, Canadian Minister of Railways, at the farewell dinner given to General Manager Hays, of the Grand Trunk, in Montreal, a few nights ago, stated that the Intercolonial lately extended into Montreal, would, in the near future, be still further extended at both ends—at the west either by purchase of the Canada Atlantic to Parry Sound, or a traffic arrangement with the Grand Trunk to Midland, or by building to French River; and eastward by extending the road to Cape Breton, so that the railroad should get its share of the grain-carrying trade of the Northwest.

Kootenay Central.—J. A. Harvey and Wm. R. Ross, of Fort Steele, B. C., have given notice of an application to the British Columbia Legislature for an act to incorporate this company to build a railroad from Fort Steele to Elko, or some other convenient point on the Crows Nest line of the C. P. R., between Elko and Wardner, thence on either the east or west side of Wigwam River, or by the most convenient route to the International boundary line; also from Fort Steele to Windemere along either the east or west side of the Kootenay River, thence to the town of Golden on the main line of the C. P. R.

Los Angeles & Salt Lake.—See Los Angeles Terminal.

Mississippi & Alabama.—The Governor of Mississippi has issued a proclamation authorizing the organization of this company to build a railroad from Meridian, Miss., to Decatur, Ala., 200 miles. The projectors are: A. Ragsdale, of New York; W. W. George, George W. Hodges and W. S. Harris, of Meridian.

Monongahela Railroad Company of New York City.—This company was incorporated in West Virginia, Dec. 21, with a capital stock of $50,000, to build a railroad from Morgantown, W. Va., on the Baltimore & Ohio, to run west about 10 miles to Cassville. The incorporators are: James A. Milholland, Cumberland, Md.; Joseph E. Gay Joffrey and William DeL. Walbridge, New York; Charles L. F. Robinson, Newport, R. I.; James A. Alexander, North Plainfield, N. J.

Northern Pacific.—Arrangements are reported completed with local property owners for a branch from Mabton, Wash., to run south about 10 miles to the foothills near Glade, and it is said that building will be begun in the spring.

Ontario Roads.—Messrs. Chrysler & Bethune, of Ottawa, have given notice of an application to the Dominion Parliament for an act to build a line from some point on the Ottawa River, in the county of Pontiac, in or between the township of Onslow and the mouth of the Dumome River, to the district drained by the Coulonge, Black and Dumome Rivers, and thence north to the shore of James Bay; also to amalgamate with, lease or enter into traffic arrangements with any other railroad company.

Oregon Railroad & Navigation.—A franchise has been asked by this company in the city of Spokane, Wash., to permit a connecting line to the Great Northern.

Oregon Roads.—At a public meeting of the land owners and residents of the Nehalen Valley, recently held in Vernonia, it was decided to indorse the proposition made by the New York & Oregon Coal & Timber Co., to build a railroad into the Valley. Dr. C. L. Hatfield, of Vernonia, was chairman of the meeting.

Pittsburgh, Binghamton & Eastern.—Locating surveys are reported completed for the entire line from Ansonia, Pa., on the Buffalo & Susquehanna, to run east to Canton, on the Northern Central line of the Pennsylvania. Anton Hardt, of Wellsboro, Pa., is Consulting Engineer. (Construction Supplement, July 27, 1900.)

Pittsburgh, Connellsville & Wheeling.—Jolly Bros. & Co., of Pittsburgh, Pa., have been awarded the contract for section No. 2 on the Pennsylvania end of this line from Millsboro, Pa., west 60.58 miles to Wheeling, W. Va., with a branch from Wheeling Creek to Moundsville, W. Va., 10.48 miles. The contracts for the West Virginia section were let some months ago and building is in progress at that end. (Nov. 23, p. 784.)

Rutland & Noyan.—Henry G. Smith, Secretary of this company, has called a meeting of the shareholders for Jan. 15, at company's office for the purpose of authorizing the directors to ratify the contract for building the road; for an issue of bonds to the extent of $100,000, to be secured by mortgage on all its property, and to determine as to leasing the road to the Rutland.

Sabine Pass & Northwestern.—Right of way is being obtained, according to report, for this company's proposed line from Sabine Pass, Tex., northwest 324 miles, via Palestine, Athens and Greenville, to Bonham. F. W. McGuire, of Dallas, President. (Construction Supplement, July 27, 1900.)

Santa Fe, Albuquerque & Pacific.—Preliminary work is being arranged, according to report, for this line from Santa Fe, N. Mex., to run southwest about 90 miles to Albuquerque, with a branch from a point near San Pedro to connect with the extension of the Chicago, Rock Island & Pacific to meet the El Paso & Northeastern, about 65 miles. The officers are given under Elections and Appointments. This is probably the same project as that entered recently under Albuquerque & Santa Fe. (Dec. 14, p. 834.)

Seattle & Tacoma Short Line.—Surveys are made and the company is completing right of way for this proposed line in Washington between the two cities named. M. D. Haynes, of Seattle, is Secretary, and G. W. Chapman, Chief Engineer. (Dec. 14, p. 834.) E. M. Hopkins, 66 Broadway, New York, is interested. (Official.)

South Ontario Pacific.—Mr. Charles Drinkwater, Secretary, has given notice of an application to the Parliament of Canada at its next session for an extension of time for building this line.

Statesboro & Register.—Surveys are reported under way for this proposed line from Statesboro, Ga., west seven miles to Register. Chas. G. Douglas, of Washington, D. C., and F. T. Lockhart, of Statesboro, are interested. (Oct. 26, p. 712.)

Toronto & Collingwood.—Messrs. McDowall & Thomson, of Toronto, are applying for incorporation of a company to build an air line railroad from Toronto to Collingwood, Ont.

Vining & Coleman.—This company is advertising for bids for building this line from a point on the Gulf, Colorado & Santa Fe, about six miles south of Coleman, to run south some 20 miles to the Vining coal mines on the Colorado River. At last entry in 1898, Geo. W. Sneed, of Austin, Tex., was the Chief Engineer. (Jan. 13, 1898, p. 34.)

West Coast.—This company, whose incorporation was recently noted, is to be practically an extension of the South Georgia, which is building an extension from Quitman, Ga., south to Tampa, Fla. The line now building to Greenville is under a Georgia charter, which is recognized by the State of Florida. (Dec. 21, p. 852.) J. W. Oglesby, of Quitman, Ga., is President of both companies. (Official.)

Williamstown Railroad Bridge & Terminal.—This company was incorporated in West Virginia, Dec. 26, with a capital stock of $5,000, to build a railroad from Marietta, Ohio, across the Ohio River to Williamstown, W. Va., and thence south about 15 miles to Parkersburg. The incorporators are: William R. Ryan and Max P. Goodman, of Cleveland, Ohio; H. C. Henderson and John A. Griffin, of Williamstown, and Thomas F. Barrett, of Parkersburg.

Yukon River & Behring Strait.—This company was incorporated in Trenton, N. J., Dec. 27, with a capital stock of $500,000, to build a railroad in Alaska. The incorporators are: Lehigh H. French and William A. Jones, Jr., Jersey City, N. J.

GENERAL RAILROAD NEWS.

Chicago & Grand Trunk.—Martin's Bank, Ltd., of London, is prepared to buy at par the certificates issued by that corporation against the deposit of first mortgage sterling 6 per cent. bonds. Certificates on which the interest of 3 per cent., due July 1, 1900, has not been paid, will receive this interest, less the income tax of one shilling in the pound. (Oct. 12, p. 680.)

Columbus & Maysville.—The stockholders of the Cincinnati, Portsmouth & Virginia, on Dec. 24, voted to take over the C. & M., which runs from Sardinia, Ohio, to Hillsboro. It now forms a part of the Hillsboro line and is operated under lease.

Erie.—It is understood that an issue of $35,000,000 collateral trust 4 per cent. bonds is to be made to cover the purchase of the Pennsylvania Coal Company's property. Of this $30,000,000, it is said, may be offered for subscription at 92½. The loan will be secured by stock of the Pennsylvania Coal Co. and the Erie & Wyoming R. R. The other $5,000,000 will be reserved for improvements.

The directors and stockholders of the Sharon Railway Co. and of the New Castle & Sharon Valley have voted to consolidate the two lines under the Sharon. (Nov. 30, p. 802.)

Fort Worth & Denver City.—A committee consisting of H. K. McHarg, Sidell Tilghman and Franklin B. Lord, invites holders of the first mortgage bonds to deposit them at once with the U. S. Trust Co. under the agreement. The earnings are insufficient to pay the full 6 per cent. per annum on the bonds. The interest paid since 1896 has been only 4 per cent. (April 13, p. 246.)

Great Northern.—The company, on Dec. 21, filed with the Minnesota Secretary of State a resolution increasing the capital stock by $1,000,000. The proceeds are to be used for improvements. (March 9, p. 162.)

Lake Shore & Michigan Southern.—The New York Stock Exchange has listed $10,218,000 additional 3½ per cent. 100-year gold bonds of 1997. These bonds were issued in exchange for $9,960,000 outstanding gold bonds and for the premium of exchange. (May 18, p. 330.)

Los Angeles Terminal.—The property is to be merged soon into the new San Pedro, Los Angeles & Salt Lake (entered heretofore as the Los Angeles & Salt Lake), and the company is now at work on 71 miles of line from Los Angeles, Cal., to a point near Redlands.

Metropolitan Street (New York City.)—The new issue of $7,000,000 stock has been underwritten by a syndicate headed by Kuhn, Loeb & Co., at 160, the price offered to stockholders. (Dec. 28, p. 868.)

Omaha & St. Louis.—Gilman, Son & Co., New York, have issued a circular in reply to the Roosevelt Committee which advised against assent to the Gilman proposition with the new committee's agreement of Dec. 10, 1900, covering the prompt payment of back interest and all receivers' certificates and other claims: the placing of the road in good order and the exchange of present bonds for new first mortgage bonds, with three years' interest guaranteed, and in addition, 40 per cent. bonus in a second security. Besides this the new construction company will build an eastern extension. The effect of the proposed agreement is practically to fulfil the obligations and redeem the pledges originally made by the construction company. (Dec. 28, p. 868.)

Pecos Valley & Northeastern.—This line, which extends from Amarillo, Tex., on the Atchison, Topeka & Santa Fe, southwest 369.7 miles to Pecos, Tex., is reported to have been acquired by the Atchison, which has had an interest in the road for some time.

Pere Marquette.—The principal and interest of the Fort Wayne & Monroe first mortgage 8 per cent. bonds, and of $20,000 Pere Marquette Transportation Co. 6 per cent. bonds, due Jan. 1, are payable at the office of Robert Winthrop & Co., New York. (April 20, p. 264.)

Southern Pacific.—Speyer & Co., New York, offer at 98 and accrued interest $10,000,000 2-5 year 4½ per cent. gold bonds, due Dec. 1, 1905, and redeemable Dec. 1, 1902, at par and accrued interest. The conditions are $50 per bond, payable on Jan. 7, 1901, and the balance on Feb. 1. (Aug. 24, p. 574.)

Tacoma & Columbia River.—The sale of this property to the Stetson Trust Co. for $17,000 was confirmed on Dec. 18, by Judge Hanford in the United States Court at Tacoma. (Sept. 7, p. 602.)